HAM RADIO TODAY NOVEMBER 1996 £2.10 VOLUME 14 NO 11

Ham Radio TODAY

Regular Scanners news

New Icom IC-R8500 wideband receiver

Yaesu FT-8000R dual band mobile

FREE PCB

NO PCB? THEN ASK YOUR NEWS AGENT!

Build a JVFAX and HamComm multimode receive interface with this PCB!

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NEXUS

Ham Radio TODAY

HAM RADIO TODAY VOLUME 14 NO.11 NOVEMBER 1996

REGULAR COLUMNS

CONSTRUCTION PROJECTS

FEATURE

REVIEWS

NEWS AND VIEWS

Left: Icom IC-R8500 receiver reviewed

Right: Construct a legal limit 50MHz amplifier

CQ

From G8IYA Editorial

This month, once again you'll undoubtedly have noticed a little 'extra' on the front cover of Ham Radio Today. Inside, you'll also see a very simple construction project, to let you use the PCB to make a multimode receive interface for Slow Scan TV, Morse code, Radio Teletype, Weather Facsimile, and the like.

Listening

I've been listening carefully to what you would like as an occasional 'cover mount'. I could put information cards or whatever on the cover, however something practical, albeit a little more expensive for us to produce, is rather different. Hopefully it's also more useful, in maybe getting amateurs to try out something different in the hobby. I do know that a large number of UK amateurs have a PC, and we've been the first ham radio magazine, worldwide, to feature radio-based PC software disks on the cover in the past. Is Ham Radio Today now again the first ham radio magazine to have a front cover PCB?

As you'll read in the construction feature, the project should be very suitable for the budding beginner in amateur radio, so if it's of little use to you, why not give it to an interested youngster? If they're already on the Internet or whatever (as many seem to be nowadays, either at home or at school), they're likely to have the software already. But now they can try some 'real' off-air reception of amateurs, weather fax maps, even full-colour SSTV pictures of amateurs and their stations!

Your views

This magazine is for you, and your views are very important. Regular readers may see that I've acted on your comments in the new design and layout of the magazine, like getting rid of the 'Dymo tape' style headings which, despite being currently 'trendy', were disliked by many (including myself, but I thought that was just a personal view). I was also very flattered to be asked to get my picture back on this page!

We'll be holding a reader's survey at the Leicester Show, which will also be your entry into a free competition. It's a chance to have your say, and maybe also tell our magazine distribution and sales department a bit about yourself and your interests. Getting the magazine onto the newsagent's shelf is a battle in itself, and the information will hopefully also allow the sales department to 'target' the right areas and outlets.

See us at Leicester!

If you'll be coming along to the Leicester show later this month, do come and say 'hello'. We're on stand 12 in the Sales Hall.

As usual, we'll have some special money-saving subscription offers for you, a free competition and other magazine sales staff will be there to answer some of your questions on the magazine. If you're having difficulty in finding it at your local newsagent, then let them know! Chris G4HCL will (hopefully!) be there to answer questions on reviews and other technical articles, maybe also with one or two of our contributors if we can 'twist their arm'. I'll hopefully be there of course to chat about the Editorial content (but please don't moan to me about sales-related matters, like the price of the magazine or whatever, which I've no control over!) so maybe you'll be able to tell me what you'd like to see in future issues of the magazine.

Differing interests

We're all different, and taking a listen on virtually any active amateur bands will usually show this. There are plenty of differing interests, and in the many 'nets' amateurs are often heard discussing the pros and cons of varying operating modes. Sometimes it's whether the amateur prefers a straight key to an electronic iambic keyer or even a mechanical 'bug' key, others hotly dispute whether the use of any key whatsoever has any relevance in the future apart from as an optional mode to keep traditions alive. Others debate the use of QRO against QRP, with even printed T-shirts available extolling the virtues of one or the other. "QRP is not for sissies" is one T-shirt slogan, another is "Life's too short for QRP". Some just get on with doing what they like, and good luck to them.

To some amateurs, getting through a pile-up with QRP CW and with a simple home-built transmitter shows skill, often acquired only after many years of experience. To others, operating in a contest with a high rate of QSOs per hour, with multiple operators using Ethernet linked PC-controlled stations with digital speech CQs or automated CW, fully computerised log-keeping and digital inter-operator communication, shows skill and efficiency.

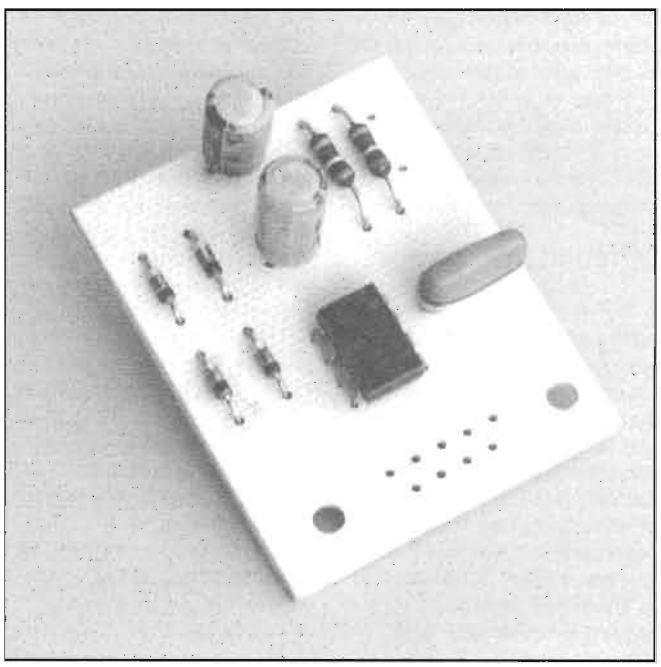
On the same subject, (believe it or not), what do you wear on your wrist to tell you the time? Is it an all-singing all-dancing microprocessor controlled thing with an LCD, accurate to a fraction of a second per day? It's certainly a display of efficiency. I wear a Swiss-made clockwork watch on my wrist. So does my Consultant Technical Editor. Years of skill and experience went into the making of these, and the Swiss have a justifiable proudness of their traditional skill. Things change of course, as they did with watchmaking. My young daughter wears a plastic quartz watch. It's a fashion-conscious "Swatch" watch, again made in Switzerland. Some people are ready to adapt, in order to survive. Others aren't, and sometimes don't.

Our Cover-Mounted PCB for a HamComm and JVFAX PC Receive Interface

Hugh Jones shows how to use this month's cover-mounted PCB to build a simple unit that transforms your PC into a radio data, fax, and SSTV decoding and display system!

The article in the March 1995 issue of HRT on building a simple JVFAX/HamComm interface promoted a considerable amount of interest, and this short feature is very much based on this to accompany the cover-mounted PCB with this month's issue.

This project could be quite suitable for the 'raw beginner' as well as expert constructors. If you've a budding youngster who's intersted in the hobby, why not let them 'have a go' and give them a helping hand with the soldering. - the end result could be the start of a new-found hobby for them!



Left: The unit with components assembled

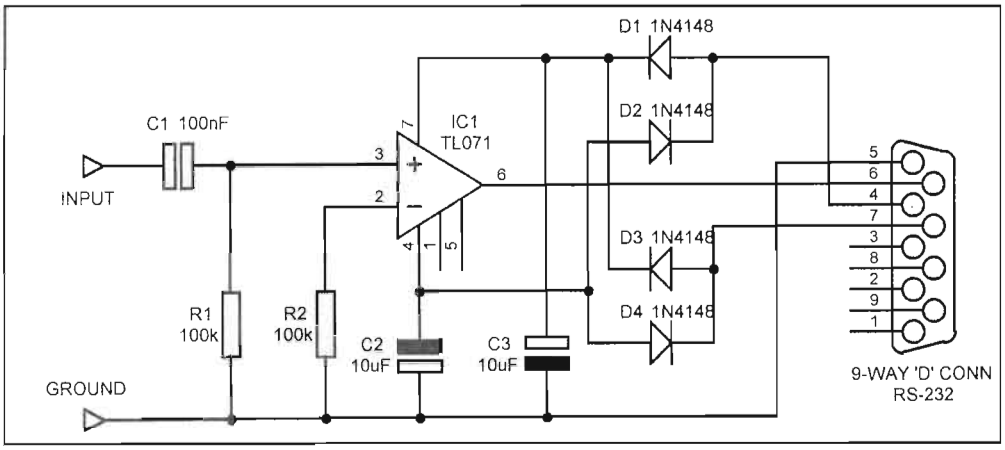
Capabilities

A number of readily available freeware and shareware ham radio PC programs are currently available which use this interface circuit arragement. The interface simply connects between the speaker output of your communications receiver or scanner, and the RS-232 connector on your PC, while the PC does the 'hard work' of decoding and display.

The JVFAX program, with its superb Fax and SSTV capabilities, has already been received by hundreds of HRT readers through the HRT software service, and HamComm V3 with its CW, RTTY and Data decoding capabilities, was on the front cover of the March 95 issue of HRT. Also, with the ever-growing use of the Internet by amateurs (and budding amateurs!), many already have suitable software, but not (until now!) the required simple interface. (If you'd like

Table 1: 9-25 way RS-232 connections

Funct.	9 way	25 way
TXD	Pin 3	Pin 2
DTR	Pin 4	Pin 20
GND	Pin 5	Pin 7
DSR	Pin 6	Pin 6
RTS	Pin 7	Pin 4



Above: Circuit diagram

LEFT: The very latest versions of HamComm and JVFAX software, available this month from the HRT Software Offer

the very latest versions of HamComm and JVFAX, both on a single 1.44Mb disk, it's available this month from the HRT Software Offer as a service to readers, for just £1.00 inc. UK p/p - Ed).

Circuit

No originality is claimed for the circuit arrangement, in fact it's the very same circuit as featured by the author of HamComm V3 in his documentation file.

The direct fitment of a board-mounting 9-way RS-232 'D' type connector is allowed for in this design, so the unit can either plug straight into the back of your PC or alternatively be fitted into a case and used with a standard RS-232 cable. If your computer uses a 25 way connector, a commonly available 9 to 25 way adaptor may be used, or you can easily wire up a 25 way connector as shown in Table 1.(see left)

Components

The components are all low-cost types, and should be readily available from virtually any component supplier. Take a look at HRT advertisements and you could even find dealers offering complete component packs for this project.

If you're selecting the components individually, then here are a few hints. For the op-amp, I've tried both 741 and TL071 types, however I'd advise against using the 741 in this interface even though it's often more commonly available. This is because the serial card on some computers cannot supply enough current to drive a 741 - the TL071 has a lower current requirement and this is the type I'd recommend. Also, although some program documentation specifies 16V capacitors, I'd recommend the use of 25V working types, especially the electrolytics, to cope with maximum possible RS-232 voltage swings. Otherwise, the tolerances of the components isn't critical, so 'junk box' components can often be used.

If in the end you don't fancy building the interface yourself, ready-built units are also available from HRT advertisers.

In use

Before plugging the assembled unit into your PC's RS-232 port, do take a couple of minutes to check your solder joints first, being especially careful to ensure there are no solder 'bridges' between tracks. For more information on testing and using the interface with your program and PC system, refer to the comprehensive documentation supplied on-disk with the HamComm and JVFAX communications programs, there are plenty of hints and tips to be found there.

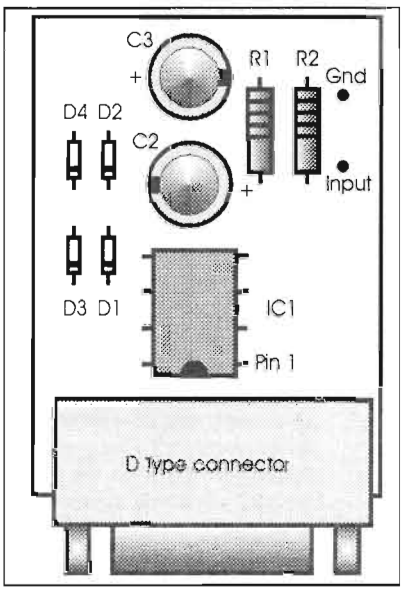
TX/RX interface

The PCB interface here is for a simple receive unit, however a 'progression' for licensed amateurs could be to add TX capabilities for the program(s) in use. You'll find the program documentation file has full information here, or you could build the TX/RX unit featured in the March 95 issue of HRT (photocopies available from the HRT Photocopies division, also note there was a slight error in that article - C3 should be reversed and connector pin 1 should not be linked to pin 9 on the PCB). Alternatively, HRT advertisers again can supply kits or ready-built units for TX/RX use.

It just remains for me to wish you good constructing, and have fun on the air!

(Any updates to this article will be available on the 24hr HRT Voicebank, Tel. 01703 263429, for at least the next 12 months. Other queries regarding the construction of this project, which are not answered by the voicebank, should be addressed to the author c/o the HRT Editor at the HRT address, enclosing an SAE if you require a reply - Ed)

Below: Component layout



Parts list;

All resistors 1/10W or 1/8W
All capacitors 25V working

C1	100nF polyester
C2, C3	100µF electrolytic
R1, R2	100k
D1-D4	1N4148
IC1	TL071

9 way D type RS-232 connector

On Test - Yaesu FT-8000R Dual Band Mobile

A tiny dual band mobile with a built-in wideband receiver - Chris Lorek investigates

You're in the market for a high power dual-band mobile rig, but you've not much room under your car's dashboard? Maybe you'd like to have an 'earwig' around other frequencies as well, such as marine band coastguard broadcasts if you also use the set on your boat?

For a combined 50W 2m rig, 35W 70cm rig, and wideband AM/FM receiver, the FT-8000R is tiny. It measures just 140mm x 40mm x 152mm, which places it firmly in the 'miniature' class. What's more, it's got a cross-band repeater built in, plus facilities for both 1200 baud and 9600 baud packet, making it a very versatile 'all-rounder'.

Open the box

I was looking forward to testing the set after returning from a family holiday, and reading about the set on the beach in a foreign magazine made me even more anxious! My wish was answered on returning to the UK, and I must say I wasn't disappointed.

On taking the set out of the box and connecting it up to my aerial system, the first thing that struck me was the good receive performance. It could hear distant 2m repeaters nicely, but without the usual interference I often get from other VHF non-amateur signals around my area. Using the main click-step tuning knob, I had a 'tune around' from 2m, and found the receive frequency range just went up, and up, and up, to 550MHz in fact. Further up, it also covered the 750-1300MHz range. It also went down, to 100MHz in fact, automatically switching to AM receive when in the VHF airband range. Dual in-band reception is also possible, for example with my local 2m repeater on one display, and the 2m calling channel, S20, on the other, giving me simultaneous reception. There's also a 'smart search' feature, which sweeps a band and loads active frequencies into dedicated memory banks. "This set's going to be interesting" I thought.

Controls

The front panel layout can be seen from the photo, where 'left' and 'right' concentric volume and squelch knobs control the left and right displayed frequencies. Briefly pressing the appropriate volume knob transfers 'control' to that band, e.g. for PTT and tuning using the click-step tuning knob at the bottom left of the front panel. A press of the 'CNTL' button however transfers tuning to the alternate band, to let you have a tune around for example, whilst keeping PTT control on the originally selected band.

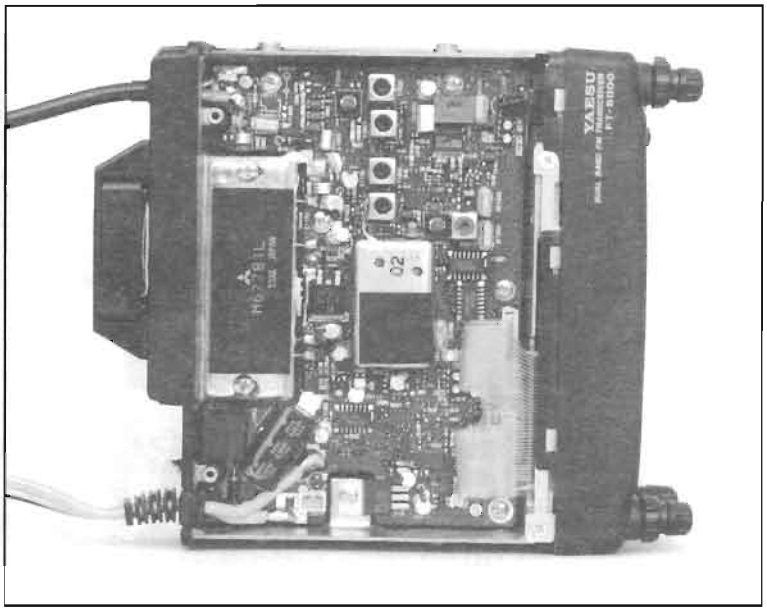
For repeater access, the FT-8000R has a built-in CTCSS (sub-tone) encoder as well as a 1750Hz toneburst, the 'Acc' button on the supplied mic being used for the 1750Hz tone. A programmable time-out timer, in one minute increments up to 60 minutes, is fitted to prevent you 'timing out' on repeaters, and of course to prevent a possible 'stuck microphone' problem, for example if you use an external mobile mic with a locking PTT.

An optional CTCSS decoder is available for quiet monitoring and 'paging'. There's also one DTMF auto-dial memory per band, however there's no facility for DTMF selective calling in the set.

A tiny high-powered mobile.The front panel has independent volume and squelch controls for each band

Together with a one-touch 'home' channel for each band, the set has 108 memory channels (54 per band), each of which can store normal or odd repeater shifts, and CTCSS tones.

Below: A compact internal circuit arrangement



Intelligence

The set includes an impressive-sounding 'Intelligent Band Display', which refers to the two small front-panel dual colour LEDs. When the receiver squelch lifts on either displayed frequency, the LED next to the appropriate left or right hand volume/squelch knob blinks green, to let you know which frequency you're listening to. If both are blinking away, then you know that both receiver squelches are open. On transmit, the appropriate LED lights red.

Round the back

A combined VHF/UHF aerial connection is used, an N-type socket being mounted on a short flying lead for this. The combined receive audio normally comes from the set's small internal speaker which is mounted on the top lid of the set's case. However, two external speaker sockets are fitted, which let you have either the combined audio from an external speaker, or the VHF audio only from the external speaker with the UHF audio from the internal speaker, or separate VHF and UHF audio from two external speakers.

For packet use a dedicated rear panel miniature DIN socket is provided, with separate pin connections for 1200 baud and 9600 baud received audio, plus common PTT and TX audio pins. The socket also provides a 'squelch open' output if you want to use this with your TNC.

The dimensions of the set are kept small by the set's heatsink being cooled by a rear panel mounted fan.

On the move

The set's small size allowed it to fit easily in a number of locations in the Editor's (equally small) car, a Ford Fiesta. My only problem was that the glass-mounted dual band mobile aerial I had fitted some time ago was only rated for a 25W transmitter. The set does have switchable 'mid' and 'low' power levels of 10W and 5W for each band, but I did want to use the set's capabilities to the full. So it was back to using my SO-239 hatchback clip mount! However, the other glass-mount aerial on the car, a wideband scanner receiver aerial covering up to 1300MHz, came in rather useful in the set's wideband receive mode.

The up/down buttons on the supplied microphone were useful in controlling frequency and to start the set scanning. But I found that, apart from the 'Acc' button (for 1750Hz toneburst, and very usefully placed it was) that none of the other buttons, i.e. P1, P2 or P, did anything at all. Neither could they be programmed to do. A pity, as a 'first glance' could imply that a few more of the set's features, such as sub-band mute, or a reverse repeater check, or high/low power switching, could be accomplished from the mic. Not so, I had to use the row of tiny front panels buttons, with their equally small function displays, for this. But then, Yaesu do have other dual-band mobiles, including one with all the controls on the hand mic, so it's really a case of 'take your pick'!

I found a handy facility in terms of control, which meant I didn't need to manually change band from the front panel on the move, was that of "Alternating Band Memory Selection". Here, repeated presses of the up/down mic buttons cycled through the memory channels numerically, but switching between bands each time as appropriate, the small green LED for each band lighting in turn to indicate which band was selected. I found this very useful on the move, and I tended to use this mode most of the time.

I found there really wasn't enough audio available from the set's internal speaker, even though this was mounted upwards, for comfortable listening at high speeds. I thus always tended to keep my trusty external mobile speaker plugged in.

At home

As well as mobile operation, I had great fun using the set in the shack. Here I found it worked just as well, and living 'on the doorstep' of both an international airport and an international shipping port made for an interesting time with the set.

I found the 'auto-search' very useful, and I believe this could also be useful for visitors to a new area with the set in their car. I only wished the set had more memory channels than 108 (yes, I do remember when synthesized 2m rigs had just 10 memory channels)!

At home, I found little problem in using the tiny front-panel controls, and here I found I tended to keep one display on, say, 2m, scanning around various pre-stored repeater and simplex frequencies, the other display for general tuning around on either VHF or UHF. An ideal case of 'two sets in one'!

When I wasn't in the shack but instead elsewhere around the house, I found the cross-band repeater facility quite handy. Here, by adding a 2m/70cm diplexer with the 70cm port connected to a dummy load, and the 2m port connected to my rooftop aerial, I could happily use my 70cm portable rig on the 'EL' (10mW) power setting and join in the chat on 2m simplex channels using my main aerial system, the FT-8000 acting as a cross-band repeater (it's perfectly legal - read your licence).

Being in a 'fringe area' between three 2m repeaters, where I could usually just about hear them on a dual-band handheld but being a weak (if any) signal back with typical portable power and aerial, I found a further useful mode of the FT-8000 was a 'one-way repeat' mode. Here, the set could be used as a 'range extender', where I listened to the 2m repeater direct but transmitted cross-band on 70cm using the handheld, employing the selectable one-way 70cm to 2m repeater function in the FT-8000.

Lab tests

A measurement with my signal generators of the receiver, showed the set was reasonably sensitive on 2m, slightly less on 70cm but still quite good. The unwanted signal rejection in all cases was very impressive, especially the 12.5kHz adjacent channel rejection, although this was a little asymmetric on 70cm if I were to be extremely critical.

On transmit, the set gave a healthy level of power output, with very well suppressed harmonics. I found extended periods on transmit surprisingly didn't cause the set to overheat, the apparently quite efficient fan-assisted cooling system doing its job quite effectively.

Conclusions

A tiny high power set, it's easy to use, with great flexibility and superb technical performance. I want one!

My thanks go to Yaesu (UK) for the loan of the review transceiver.

LABORATORY RESULTS:

All measurements taken using stabilized 13.8V DC power supply connected to the supplied DC lead, high power TX, otherwise stated.

RECEIVER

Squelch Sensitivity;

	145MHz	435MHz
Threshold;	0.09µV pd (4dB SINAD)	0.14µV pd (6dB SINAD)
Maximum;	0.26µV pd (22dB SINAD)	0.39µV pd (25dB SINAD)

Intermodulation Rejection;

Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;

	145MHz	435MHz
25/50kHz spacing;	78.4dB	70.1dB
50/100kHz spacing;	76.8dB	67.3dB

Adjacent Channel Selectivity;

Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;

	145MHz	435MHz
+12.5kHz;	46.5dB	55.2dB
-12.5kHz;	40.7dB	24.5dB
+25kHz;	71.9dB	68.0dB
-25kHz;	71.6dB	67.1dB

Blocking;

Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

	145MHz	435MHz
+100kHz;	86.7dB	80.2dB
+1MHz;	97.3dB	92.9dB
+10MHz;	96.7dB	95.5dB

Maximum Audio Output;

Measured at 1kHz on the onset of clipping, 8 ohm load;

145MHz	435MHz
2.45W RMS	2.46W RMS

S-Meter Linearity;

	145MHz		435MHz	
	Sig Level	Rel. Level	Sig. Level	Rel. level
S1	0.11	-30.3dB	0.18dB	-27.8dB
S2	0.17	-26.6dB	0.24dB	-25.0dB
S3	0.25	-23.4dB	0.39dB	-20.9dB
S4	0.44	-18.5dB	0.53dB	-18.2dB
S5	0.71	-14.3dB	0.71dB	-15.6dB
S6	1.09	-10.5dB	1.09dB	-11.9dB
S7	1.60	-7.2dB	1.84dB	-7.3dB
S8	2.25	-4.3dB	2.87dB	-3.3dB
S9	3.67	0dB ref	4.32dB	0dB ref
S9+	6.09	+4.4dB	7.57dB	+4.9dB
S9++	10.1	+8.8dB	12.3dB	+9.1dB

Sensitivity;

Input level required to give 12dB SINAD;

144MHz;0.14µV pd
145MHz;0.13µV pd
146MHz;0.14µV pd
430MHz;0.20µV pd
435MHz;0.19µV pd
440MHz;0.18µV pd

Image Rejection;

Increase in level of signal at 1st IF (45.05MHz 2m, 58.525MHz 70cm) and 2nd IF (455kHz) image frequencies, and half 1st IF, over level of on-channel signal, to give identical 12dB SINAD signal;

	145MHz	435MHz
Half 1st IF	106.4dB	106.6dB
1st Image	87.6dB	88.4dB
2nd Image	>110dB	>110dB

TRANSMITTER

Harmonics;

	145MHz	435MHz
2nd Harmonic;	-64dBc	<-90dBc
3rd Harmonic;	<-90dBc	<-90dBc
4th Harmonic;	<-90dBc	-77dBc
4th Harmonic;	<-90dBc	-
5th Harmonic;	<-90dBc	-
6th Harmonic;	<-90dBc	-
7th Harmonic;	<-90dBc	-

Peak Deviation

145MHz	435MHz
5.43kHz	6.09kHz

Toneburst Deviation

145MHz	435MHz
2.56kHz	2.43kHz

Frequency Accuracy;

145MHz	435MHz
-164Hz	-582Hz

TX Power and Current Consumption;

Freq.	Power	10.8V Supply	13.8V Supply	15.6V Supply
144MHz	High	32.9W/7.65A	48.0W/9.20A	48.5W/9.55A
	Mid	11.3W/4.80A	11.3W/4.75A	11.3W/4.95A
	Low	4.59W/3.45A	4.64W/3.35A	4.64W/3.50A
145MHz	High	32.6W/7.60A	48.7W/9.15A	49.0W/9.25A
	Mid	11.4W/4.70A	11.4W/4.70A	11.5W/4.75A
	Low	4.67W/3.35A	4.69W/3.30A	4.69W/3.50A
146MHz	High	32.4W/7.40A	49.5W/9.05A	49.8W/9.05A
	Mid	11.5W/4.60A	11.6W/4.65A	11.6W/4.70A
	Low	4.75W/3.25A	4.75W/3.30A	4.77W/3.35A
430MHz	High	19.9W/5.70A	32.4W/6.80A	32.6W/6.50A
	Mid	8.83W/3.55A	8.98W3.40A	9.09W/3.50A
	Low	4.18W/2.70A	4.26W/2.65A	4.31W/2.65A
435MHz	High	18.9W/5.55A	33.4W/7.30A	33.4W/6.70A
	Mid	8.88W/3.50A	9.04W/3.45A	9.14W/3.50A
	Low	4.31W/2.80A	4.34W/2.70A	4.44W/2.60A
440MHz	High	17.8W/5.50A	34.2W/7.85A	34.2W/6.95A
	Mid	8.88W/3.50A	9.09W/3.50A	9.14W/3.50A
	Low	4.41W/2.85A	4.46W/2.85A	4.49W/2.80A

Reviewed - The Icom IC-R8500 Receiver

With 100kHz to 2000MHz in one receiver, our Consultant Technical Editor had an interesting time in testing the set!

I remember, many years ago, being able to briefly 'get my hands on' one of the latest Icom IC-R7000 receivers, which was in use in the RF equipment design laboratory I worked in at the time. I marvelled at the wide frequency range of the table-top set with its all-mode receive capability. Since then, Icom have progressed the 7000 series design, and have obviously listened to the needs of users, especially with regard to 'add-on' HF coverage. The result is the IC-R8500, an all-mode receiver capable of tuning between 100kHz to 2000MHz, filled with virtually all the operating features most people would ever need.

The IC-R8500 is a table-top sized set

It isn't a small set, neither is it light. Measuring 287mm (W) x 112mm (H) x 309mm (D) and weighing 7kg, places it firmly in the fixed 'table-top' mode of operation. However, you can add an optional carrying handle and even a mobile mounting bracket, should you feel the need to move it around regularly.

Internals

Taking off the lids shows a solid die-cast chassis, with well-screened 'innards'. All this suggests a robust set that's been well thought out at the design stage, especially with regard to preventing spurious signals 'hopping' from one board to the next, as they often do in many tightly-packed receivers.

The receiver uses a triple conversion superheterodyne circuit, with fixed 2nd and 3rd IFs of 10.7MHz and 455kHz respectively (although the 3rd IF is not used in Wideband FM mode). The HF section, covering 0.1 to 30MHz, uses a high 1st IF of 48.8MHz for good image rejection and 'roof filtering'. From 30MHz to 500MHz the 1st IF is higher still at 778.7MHz, and from 500MHz to 1025MHz it becomes 266.7MHz. The set's coverage above 1025MHz uses an internal converter, and Icom only guarantee the specifications here to between 1240MHz and 1300MHz, this being a section of the amateur 23cm band in the UK.

Control and memories

The front panel has the usual rotary knob and keypad controls for frequency entry and tuning, plus a well laid-out array of buttons and knobs for mode control etc. The main VFO tuning knob is a large flywheel weighted type, a small 'dial brake' adjustment letting you vary the tension of this. Tuning steps can be selected from 10, 50 and 100Hz, 1, 2.5, 5, 9, 10, 12.5, 20, 25, 100kHz and 1MHz, plus a programmable step between 500Hz and 99.5kHz in 500Hz increments. Besides the main knob, a small click-step knob at the bottom right of the panel is provided to step between memory channels, adjacent push-

The front panel controls are easy to use. The main tuning knob is a large flywheel weighted type.

buttons controlling the various memory and scanning functions.

Mode change is by a single button push, repeated presses of the appropriate mode button changing between, for example, AM (N), (M) and (W), and CW, LSB and USB.

Filters

Altogether, the set can receive CW, LSB, USB, AM, FM, and Wide FM, with a variety of filters built in for use with these modes. CW and SSB uses a 2.2kHz filter, which can also be switched into use for AM (N). If you're a CW enthusiast, then an optional 500Hz filter can be internally fitted to add a switchable narrow CW mode. AM (M) uses a 5.5kHz filter, which again can be switched into use for FM (N), with FM usually using a 12kHz filter which, surprise, surprise, can also be switched in for AM (W) use. Wideband FM has its own 150kHz wide filter

An IF shift control is fitted for use in SSB and CW modes, and an audio peak filter, variable in its centre frequency, can be switched in - this can be used in either 'wide' or 'narrow' bandwidth modes.

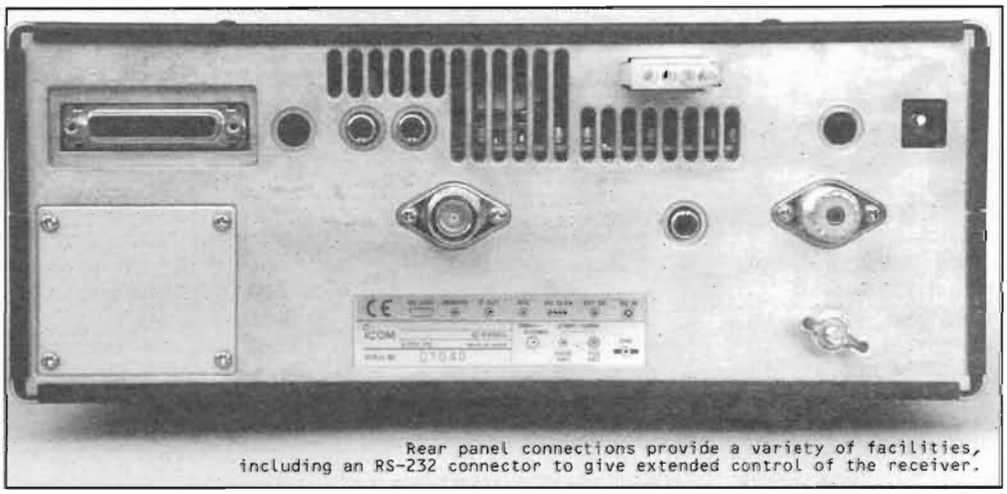
Noise abatement

Switchable 10dB and 20dB front-end attenuators are provided as a QRM-fighting measure, both can also be switched in to give 30dB total attenuation. The AGC (Automatic Gain Control) for SSB/CW and AM can be switched between fast and slow, and a push-button noise blanker is provided to help reduce pulse-type, e.g., ignition, noise.

For FM, a switchable AFC (Automatic Frequency Control) is also available. In use, this automatically re-tunes the receiver frequency (it's quite novel to watch it do so on the digital frequency display!) to centre-tune the received FM signal. The rotary squelch control acts as an FM noise squelch up to the mid-point of its travel, after that as an all-mode carrier level squelch, the S-meter varying to show you the carrier mute level.

Scanning

The set has all the scanning 'bells and whistles' you'd expect, with 10 programmable search banks and 1000 standard memory channels initially arranged into 20 banks of 40 channels each.



Rear panel connections provide a variety of facilities, including an RS-232 connector to give extended control of the receiver.

The size of the banks can be rearranged in size to suit your needs, and your programmed channels can be swapped between banks as you wish. Together with the usual scanning and search facilities, including 'voice operated' scan halt and a variable delay resume, an 'auto-memory write' mode is fitted. This searches between two programmed limits and automatically writes the 'active' frequencies into up to 100 memories for you. Up to 100 'skip' channels are also programmable, which the set then automatically ignores in search or auto memory-write mode. Each memory channel may be assigned a short name if you wish, as can each search bank.

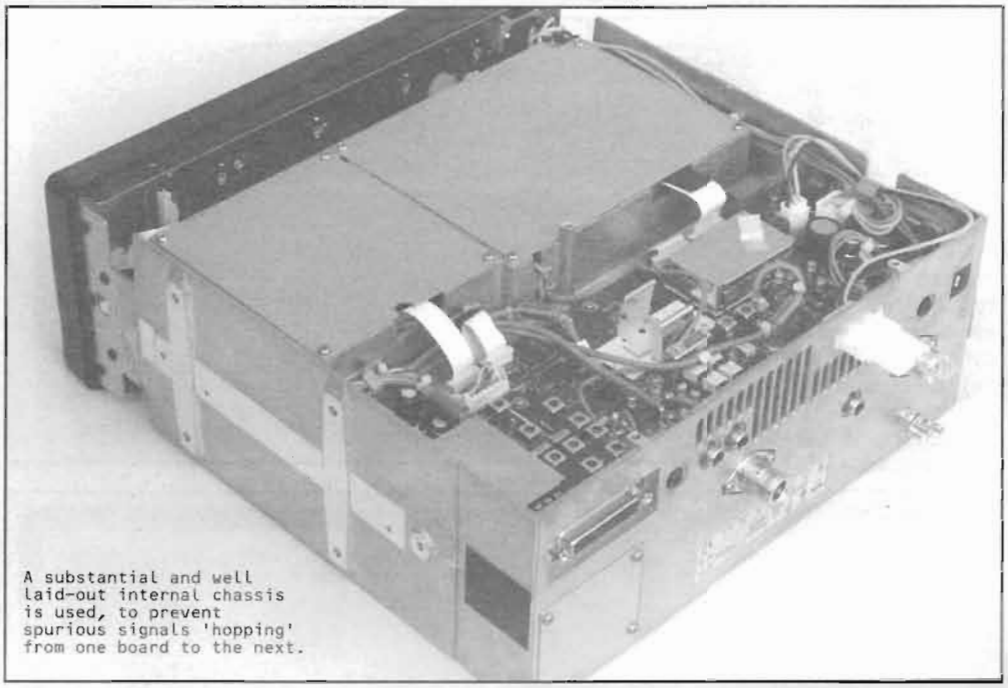
An internal speech synthesizer is available as an optional 'extra'.

Remote control

If all that's not enough, then you can also connect your computer's RS-232 port via a direct lead to the set's rear panel RS-232 connector, to give extended control of the receiver. The IC-R8500 manual lists the PC commands you need to control the set's various functions, and no doubt there will be commercial or shareware offerings for this appearing in due course. Also on the rear panel is a C-IV 'remote' connector, this using Icom's inter-unit data standard for rig control. With this, you can couple the IC-R8500 to other Icom rigs, and to your PC via an interface, for automatic frequency tracking and the like, e.g. for satellite operation.

Connectors

Three aerial connectors are fitted, an N type for VHF/UHF use (above 30MHz), and two connectors for HF (up to 30MHz). The first HF connector is a standard SO-239 socket for coax-fed 50 ohm aerials, the second is a small phono socket for higher impedance aerials such as a long wire, the receiver's input impedance here being 500 ohm. There's also a ground terminal, an external speaker jack, and two DC input connectors - one for use with the supplied DC cable, the other for the supplied AC mains adapter. An IF output socket carries both 9V DC and the set's 10.7MHz IF signal, to let you connect external accessories such as Icom's TV receive adaptor or similar external demodulators - maybe even a spectrum display. An AGC socket serves a dual purpose, dependant on the setting of an internal jumper. It can give either an AGC voltage output, again for external accessories, or 'raw' non de-emphasized receive audio, for 9600 baud packet detection or similar data decoders, or maybe even for



A substantial and well laid-out internal chassis is used, to prevent spurious signals 'hopping' from one board to the next.

pager message demodulation.

In Use

In using the IC-R8500 to tune around the HF bands, both amateur and broadcast, I found the receiver very easy to use. With 10Hz tuning steps selected for SSB listening, the flywheel knob was a pleasure in operation, spinning this fast automatically speeded the tuning rate up to help me get from one part of the band to another a little more quickly. Besides the receiver's LCD showing the various frequency, mode, and filter settings, changing filters and modes also brought up a small dot-matrix display of the filter passband - a novel touch!

The IF shift was useful in helping me reduce adjacent signal interference, the Audio Peak Filter also helping to 'clean up' received signals - the narrow APF being very useful in data decoding as well as for CW. The BFO (Beat Frequency Oscillator) could also be offset from centre if needed, by keeping the SSB button pressed for over a second - this again was occasionally useful in fighting adjacent frequency interference on a crowded band.

On the lower amateur bands of 80m and 40m, and especially on the 49m and 41m broadcast bands, with the set connected to my 40/80m trap dipole I found I usually always had to have at least the 10dB attenuator switched in to prevent receiver overload. Switching in the noise blanker on a crowed band, e.g. 40m at night, made things significantly worse with more apparent 'splitching' from nearby signals.

I found that, although the manual does warn of this, the set doesn't store the last-used VFO frequency when it's switched off. So, after I'd been listening to, say, a broadcast band station or an amateur band net, I'd lose the tuned frequency as soon as I switched the set off.

Higher up

On VHF/UHF, I found the receiver to be superb. After being used to constant overload and image problems when using cheap, and some not-so-cheap, base scanners on my outdoor aerial system, the IC-R8500 made a very refreshing change! Signals came and went cleanly, and I spent many happy hours in my shack with the set. I found the receiver sensitivity to be very good across all frequencies, with the rejection of unwanted signals excellent. Even my semi-local 1296MHz beacon came in very well indeed on the set.

I used the 'auto memory write' a great deal in finding active frequencies in my area, having confidence now that I could 'trust' the results. My only problem was in transferring the many subsequent frequencies from the 'auto' bank to normal memory channels for subsequent scanning (i.e. when I needed to clear the auto bank for a new search). It did take me quite some time! I also found I had to be rather careful, as once, after I'd been searching a band segment for around eight hours with around 95 channels automatically stored, a press of the wrong button instantly deleted every single frequency the set had found in 'auto' mode - oh dear (or words to that effect)!

Lab tests

My first thought was, should I test it as a HF receiver, or as a VHF/UHF scanner? The IC-R8500 is both, in one box! So I ending up performing two sets of measurements, one in G4HCL 'HF mode' mainly looking at SSB/CW HF use with strong-signal handling and individual filter selectivity taken into careful consideration, another in 'Scanner mode' mainly for AM/FM receiver performance and adjacent channel/image rejection.

The results on HF were quite reasonable, although as I found on air, not up to that, in terms of intermodulation rejection for example, of a typical HF receiver of less than half the IC-R8500's price. However, the IF filter selectivities and shape factors were excellent, being very 'steep sided'. Unfortunately I couldn't measure below the -60dB mark due to close-in blocking limitations in the set, but I'm sure that even the -80dB selectivity would have been excellent also.

On VHF/UHF, bearing in mind the generally lower relative levels of signals, the set measured up very well indeed, I couldn't complain at all, the set being well up to almost professional standards.

Conclusion

The IC-R8500 is an extremely versatile shack receiver, its wide coverage range and many scanning and tuning features certainly put it in the 'upper class' of wide coverage receivers. Technically, I found the VHF/UHF side very good, although the HF receive section was a bit of a compromise in its strong signal handling performance when compared with a typical dedicated but significantly lower priced HF receiver. My overall conclusion is that the IC-R8500 is an excellent and very flexible VHF/UHF all-mode receiver (can I have one please, Mrs. Editor?), with HF coverage 'thrown in' for good measure.

My thanks go to Icom UK for the loan of the review set.

LABORATORY RESULTS:

All measurements carried out, with attenuator off, on (HF) 21.4MHz in standard bandwidth SSB, and (VHF/UHF) on 145MHz FM standard bandwidth.

Sensitivity;

Input level in µV pd required to give 12dB SINAD;

Freq. MHz	SSB/CW	AM	FM
0.1	0.73	2.01	0.94
0.5	0.70	1.95	0.91
1.8	0.17	0.48	0.23
3.5	0.19	0.50	0.24
7.0	0.16	0.45	0.22
10.1	0.17	0.43	0.21
14.0	0.16	0.42	0.21
18.1	0.15	0.38	0.18
21.0	0.14	0.38	0.18
24.9	0.13	0.33	0.16
28.5	0.15	0.41	0.20
29.5	0.15	0.43	0.21
40	0.17	0.44	0.22
50	0.16	0.46	0.22
60	0.17	0.45	0.22
70	0.17	0.47	0.23
80	0.17	0.47	0.22
100	0.17	0.46	0.22
120	0.16	0.46	0.21
145	0.17	0.45	0.21
200	0.17	0.48	0.23
300	0.16	0.43	0.21
400	0.15	0.40	0.19
435	0.15	0.41	0.19
500	0.25	0.73	0.34
600	0.28	0.79	0.36
700	0.28	0.78	0.37
800	0.30	0.78	0.38
900	0.26	0.70	0.33
1000	0.30	-	0.39
1300	0.22	-	0.31
1500	0.25	-	0.34
1800	0.34	-	0.43
2000	0.41	-	0.52

Image Rejection;

Increase in level of signal at the first, second and third IF image frequencies, over level of on-channel signal, giving identical 12dB SINAD signal;

Freq. MHz	1st IF Image Rej.	2nd Image Rej.	3rd IF Image Rej.
10	108.2dB	>110dB	>110dB
145	>110dB	70.7dB	>110dB
435	>110dB	68.8dB	>110dB
1000	92.0dB	>110dB	>110dB

S-Meter Linearity

Measured on 21.4MHz SSB;

Indication	Sig. Level	Rel. Level
S1	1.31µV pd	-39.7dB
S2	1.47µV pd	-38.7dB
S3	1.72µV pd	-37.3dB
S4	3.01µV pd	-32.4dB
S5	5.28µV pd	-27.5dB
S6	9.60µV pd	-22.4dB
S7	19.7µV pd	-16.1dB
S8	38.8µV pd	-10.2dB
S9	70.7µV pd	0dB ref
S9+20dB	538µV pd	+12.7dB
S9+40dB	4.39mV pd	+30.9dB
S9+60dB	62.3mV pd	+53.9dB

Blocking;

Measured on 21.4MHz SSB as increase over 12dB SINAD level of interfering signal, unmodulated carrier, causing 6dB degradation in 12dB SINAD on-channel signal;

+50kHz;	102.0dB
+100kHz;	103.3dB
+200kHz;	105.2dB

Measured on 145MHz FM as increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

+100kHz;	78.4dB
+1MHz;	94.3dB
+10MHz;	95.9dB

Attenuator Level;

Measured on 145MHz FM;

10dB;	9.7dB
20dB;	18.9dB
10+20dB;	28.6dB

Selectivity;

Measured on 21.4MHz;

	CW/SSB/AM(N)	AM(M)/FM(N)	AM(W)/FM
-3dB	2.43kHz	7.23kHz	12.72kHz
-6dB	2.82kHz	7.91kHz	14.06kHz
-20dB	3.38kHz	9.21kHz	18.44kHz
-40dB	3.74kHz	10.59kHz	20.61kHz
-60dB	3.86kHz	11.06kHz	22.47kHz

3rd Order Intermodulation Rejection;

Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product, measured at 21.4MHz SSB;

10/20kHz spacing;	64.4dB
20/40kHz spacing;	73.2dB
50/100kHz spacing;	85.6dB
100/200kHz spacing;	85.7dB

Measured on 145MHz FM, otherwise as above;

25/50kHz spacing;	75.2dB
50/100kHz spacing;	74.6dB
100/200kHz spacing;	74.7dB

Maximum Audio Output;

Measured at speaker/earphone socket, 1kHz audio at the onset of clipping (10% distortion), 8 ohm resistive load, measured on 145MHz FM;

1.94W RMS

FM Adjacent Channel Rejection;

Measured on 145MHz FM and FM(N) as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;

	FM(N)	FM
+12.5kHz;	59.1dB	49.6dB
-12.5kHz;	58.8dB	44.4dB
+25kHz:	67.0dB	64.9dB
-25kHz;	67.5dB	65.3dB

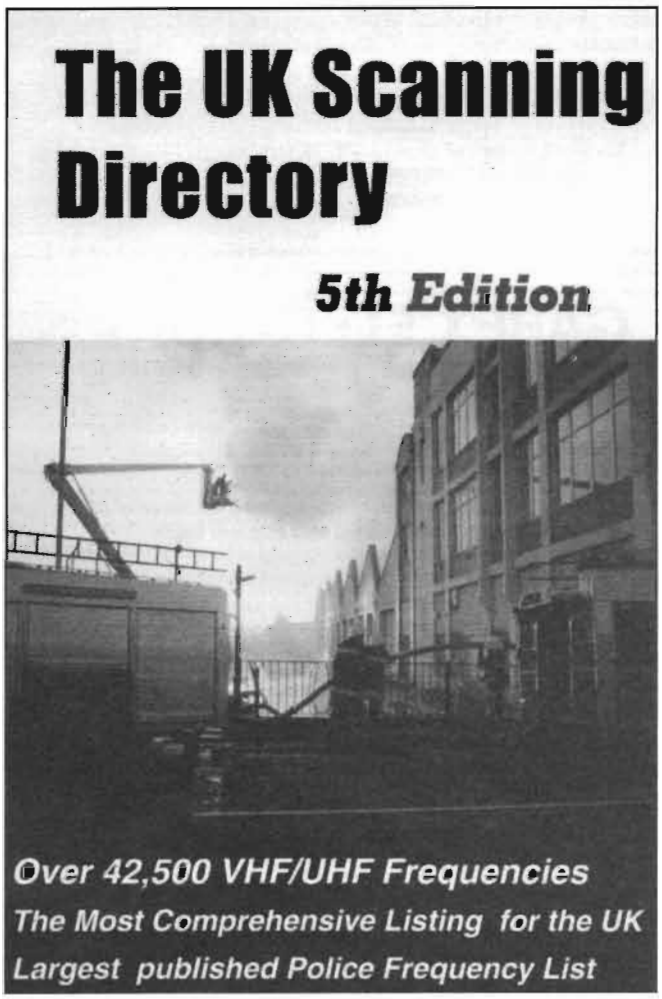
Squelch Sensitivity;

Level of signal required to raise receiver squelch, measured on 145MHz FM;

Threshold;	0.15µV pd (6dB SINAD)
Mid point;	0.52µV pd (27dB SINAD)
Maximum;	2.97mV pd (33dB SINAD)

SCANNERS

Bill Robertson reviews the latest scanner books and answers the often-asked question of "what aerial?"



The UK Scanning Directory 5th Edition, this is what must be the UK's largest and most detailed frequency listing available.

Interproducts in Perth have a reputation in publishing a number of books of interest to the scanner and short wave listener. Their latest two scanner books are no exception.

UK Scanning Directory

Now in its 5th Edition, this superb book currently has no less than 554 pages, packed with frequency, mode, user and location listings, giving what must be the UK largest and most detailed frequency listing available.

Covering the spectrum of 25 to 1800MHz, virtually anything receivable in that range is listed, from aircraft to baby alarms, from emergency services to local taxi firms, is covered. No listing can be described as "complete" of course, but this book goes a long way towards that goal.

When I reviewed an earlier Edition of the UK Scanning Directory, I wondered how they got away with listing so many 'sensitive' frequencies. Well, this one's got even more! The publishers are constantly on the lookout for more frequencies, and they offer readers of their guides an incentive for submitting new frequencies they've found. Thus, this guide has progressively grown and grown, with more and more information given in each edition. This edition is again A5 sized, but unlike the previous spiral-bound version this one has a glued binding for the pages due to the thickness.

It includes, inevitably, some mistakes and duplications. For example I'm sure that 452.425MHz isn't used by Fareham taxis as well as a certain law-enforcement user in the same town which the book also lists. But then, 'proof reading' something as vast as this is quite a task. Indeed, searching through for the frequencies and users in a given area could easily take you several days. However, it's very useful to help identifying users found during a 'search' of, say, the VHF or UHF airband or the VHF marine band, and of course lots of other bands. Overall, I found the book most interesting and informative, an essential companion at my listening post.

My conclusion? If scanning is your hobby, you need this book. Get it!

Scanner Busters 2

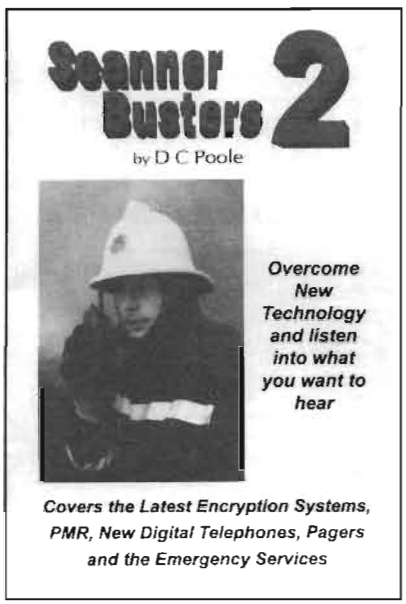
If you're 'into' the hobby of scanning you'll no doubt have come across various encrypted and digital forms of signals. Others are a 'mixture', with various signalling tones and data bursts accompanying the analogue signals, which themselves seem to hop around between channels in an almost random nature.

Scanner Busters 2, in its 100 A5 sized pages, gives an insight to many of the 'new' forms of radio communication you'll find in the VHF/UHF spectrum, including analogue and digital trunked systems such as MPT1327 trunking, GSM and PCN digital trunking, encrypted systems, from simple inversion to rolling-code scrambling, pagers, and spread spectrum radios.

It's a book for the technically interested hobbyist, providing an insight to the

SCANNERS

Scanner Busters 2 gives an insight to many of the 'new' forms of radio communication you'll find in the VHF/UHF spectrum.



many modern forms of communications in current use. It also gives a few hints on how to get the 'best out of a bad job' in attempting to listening into some trunked systems in a given location with a scanner, e.g. by careful listening and pre-programming. The rest, such as encryption and digital communication systems, is left to repeated conclusions such as "maybe in the future a clever hobbyist will devise a circuit" or similar.

In all, I found the book a fascinating read. It's been well-researched, and it offers a wealth of interesting information to the 'technically aware' radio hobbyist.

The sub-heading of this book's title is "Overcome New Technology and listen into what you want to hear". Well, sometimes, not always, but maybe a little more in the years to come!

Both the UK Scanning Directory (ISBN 1 900445 01 8, priced at £18.50) and Scanner Busters 2 (ISBN 1 900445 02 0, priced £6.00) should be available from specialist radio dealers or on order from your local bookshop. My thanks go to the publishers, Interproducts (Tel. 01738 441199) for supplying the books for review.

Scanner aerial planning permission?

Steve in Bristol says he's recently started with a cheap scanner, and would like some advice on a better aerial than the set-top helical. He's considering a home-made vertical dipole in the loft, cut for the frequency he listens to the most, but says his house is in a terrace in a low lying area. He also asks whether planning permission is needed to put a discone on the roof or chimney breast.

An aerial in a terraced roof loft, discone or otherwise, wouldn't work too well in directions along the line of the terrace due to the screening effect of the various walls either side. Here, the best place really is to see if an aerial above the roof line is possible. Technically, planning permission is needed for anything on your roof with some defined exceptions, such as a satellite TV dish within a given size. Additionally, a normal UHF TV aerial is usually legally regarded as "de minimus", i.e. too small to worry about. Except of course if you live in a listed building, or in a conservation area of outstanding natural beauty, where changes to the appearance of a building do need to be formally authorised. Likewise if the deeds to your house contain any restrictive covenants about what you can or can't put up.

However, if you live in a typical 'normal' area with neighbouring TV aerials, satellite dishes etc., then my advice would be to put an inconspicuous looking wideband scanner aerial up, for example a thin fibreglass-encapsulated vertical aerial typically 1m long. You could easily mount this on your existing TV aerial pole, and if you paint the scanner aerial blue-grey to match the sky it'll be even less noticeable. A discone, however, could attract rather more attention due to its appearance, yet in my experience one of the widely available multi-band verticals work just as well in many cases.

If you'd like more information on choosing a scanner aerial, you'll find this in the "Which Scanner Aerial" feature article in the March 1992 issue.

PC as a scanner

Justin asks if there is a hardware/software combination that would turn a computer into a scanner. The answer to this is 'yes', for example the WinRadio system which was reviewed in the July 96 issue of Ham Radio Today. This basically uses a plug-in PC card for the receiving hardware, together with Windows-based software to provide a 'virtual' radio front panel on your PC screen. I'm sure that, in the future, there will be many more offerings like this. Also, with PC processing speeds increasing, I'm also sure the day will come when you'll be able to connect your aerial directly into a 'universal' plug-in DSP board yet to be developed, and run suitable software for tuning and decoding, at least of the lower frequency HF signals to begin with.

But, back to the present, the big problem which must be overcome is computer noise affecting received signals. The WinRadio manages this fairly well, however computer control of an external scanner often offers the best performance and flexibility at this time. With this in mind, I'm told that Lowe Electronics have just launched details of their forthcoming Windows based RCON receiver control software. Amongst its many 'bells and whistles' of mode and filter selection plus various band searches, it has a spectrum analyser function, off-air record and play facilities, various timers, and a built-in transmissions database plus support for the Klingenfuss Super Frequency List on CD-ROM. The program supports the Lowe HF150 and HF250, AOR AR8000, AR3000A, and AR5000, the NRD 535 and the Icom IC-R72E and IC-R7100. You can get further details from Lowe Electronics, Tel. 01629 580800).

Bill Robertson is pleased to hear from readers and will answer queries through this column - address your letters to; Bill Robertson, c/o HRT Editor, Nexus, Nexus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or by fax or email to the Ham Radio Today direct Editorial contact points.

Please remember that reception of some services may not be permitted without appropriate authority. The RA's information sheet on 'Scanners' has full information for the UK.

A High Power Amplifier For 50MHz

Geoff Brown GJ4ICD commences our multi-part winter project to construct a legal-limit 6m amplifier

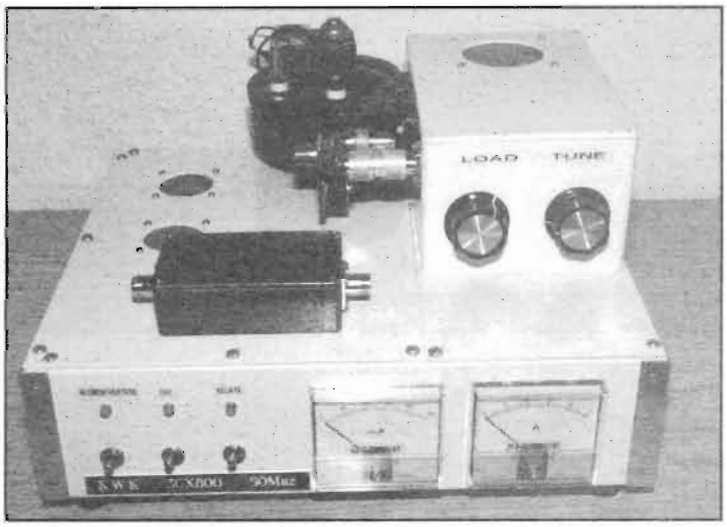
This Ham Radio Today construction project is for a high power RF amplifier for 50MHz. The design is well-proven, with a number of these amplifiers having been built by Geoff for amateurs around the world. The project is planned to run over about three issues, to form a 'step by step' winter project.

Overview

As cycle 23 is fast approaching, many readers will be hoping for that elusive contact with Australia or something special. Now that Europe has so much 50MHz activity, the trip to such as Oceania becomes much harder, in other words, the QRP station will find things hard when those glorious openings return once again. This is because of increased competition from around Europe.

There are many arguments for and against low and high power, but my simplest offering is that with QRO one quick call to the DX station should be all you need. With QRP this can sometimes add up to several calls. Albeit neither of the two are always perfect, or the right choice! A simple approach has been chosen, that is, to use a ceramic valve that uses few voltages, so as to make the power supply as simple as possible. A triode was chosen that is frequently becoming available on the second-hand market, the 3CX800A7. This valve is preferred to the 4CX250B series of valves (tetrodes), as they require a more complex power supply for the beginner. Also, the 3CX800 sockets are extremely cheap when compared to the 4CX250B series sockets.

The amplifier is built in two units, the power supply and the RF deck. The RF circuitry has only around a dozen components, the input circuit is a 'T' network and the output circuit is a pi-L network. These two units can be mounted together, or split (RF deck on the bench and power supply on the floor/under the bench). The building of amateur equipment seems to be on the decrease, this may be due to the more complex designs and equipment needed to produce a good quality finished unit. Test equipment and expensive manufacturing tools, like sheet metal benders, seem to put most people off 'having a go' at something really special, however, this is about to change!



The finished unit with power supply

All that is needed to construct this amplifier and power supply are just the normal tools found in everyday use (hand drill and bits, maybe electric and a few good metal files, a soldering iron, and a hacksaw). If you have other sophisticated tools like hole cutters then this will make life easier, but I must stress that they are not essential.

There are several points that must be made before proceeding with the construction. Firstly, if you have no experience with valve type amplifiers then think twice before attempting this project. This is because; a) ceramic valves are expensive and can easily be damaged, by having little or no knowledge of how such a device works, and b) there are very high voltages that supply the valve in order for it to operate, these high voltages can kill so please be very careful! On the other hand, if you are careful and cautious then this project will help you understand the world of high power valves for RF applications.

Solid-state versus valves

A valve type 400W amplifier and power supply for 50MHz, is quite expensive to buy off the shelf (£1200 to £1400). To buy a 400W solid-state amplifier and power supply is basically impossible, but if available would cost around the same price.To build a 400W valve amplifier and power supply, is cheaper than to build a 400W solid-state amplifier and its 50V power supply. Admittedly, a little daunting for the inexperienced, but there again so can solid-state amplifiers, as there are certain rules to follow in their strong RF fields.

Visual indication of a valve type amplifier's metering will tell you everything about what is happening, and watched carefully, the meters will tell their story. Solid-state amplifiers just don't give any warning of their condition, just pop and they're gone! So why choose a valve? Well there are more and more second-hand ceramic valves becoming available, even valves from Russia have been spotted at Friedrichshafen in Germany. These apparently were brought

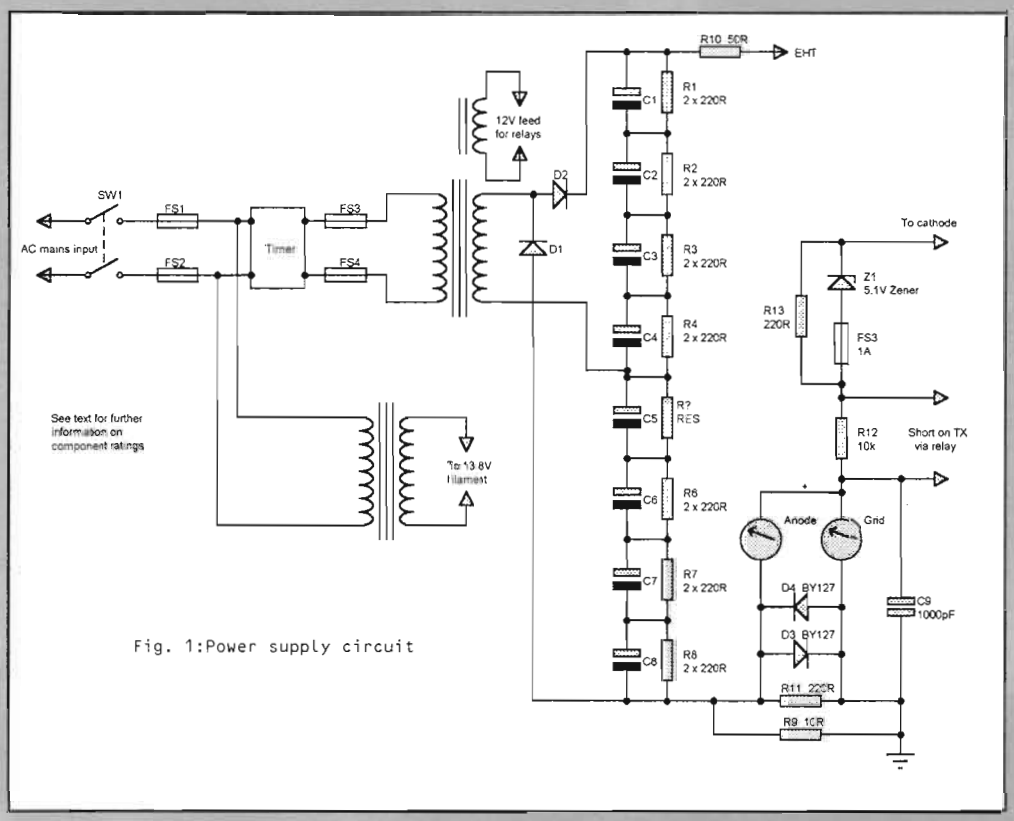


Fig. 1:Power supply circuit

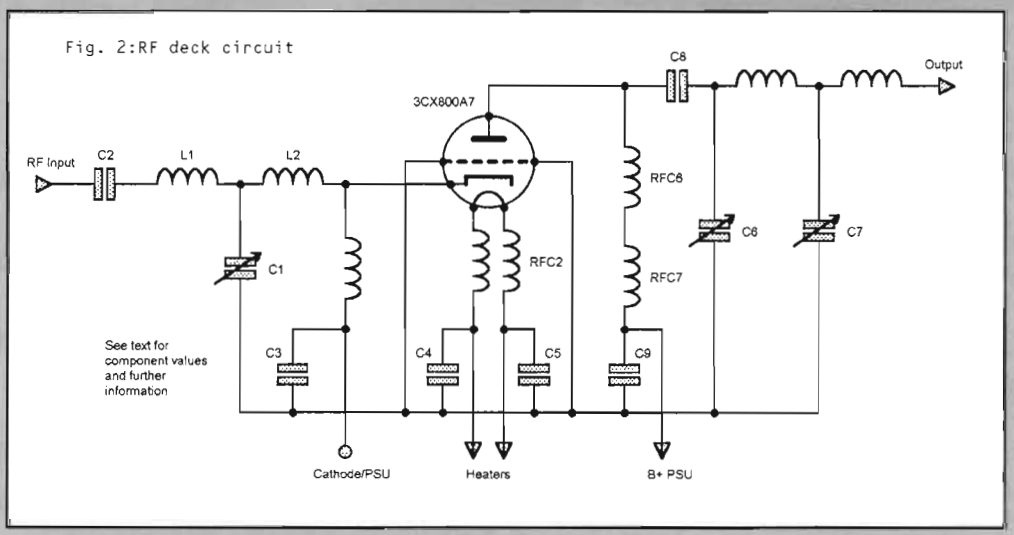


Fig. 2:RF deck circuit

by Russian amateurs who had to sell them in order to pay for their return petrol to get home!

Most of these valves are known as 'pull-outs'. This means that after, say, 1000 hours of commercial service they are literally 'pulled out' of service and given away to the employees (they're the ones you want!). The valve I used in this design has been around for many years, and is now starting to appear on the second-hand market from commercial radio stations, it is a triode known as the 3CX800A7. To buy this valve new it would cost about £250, or if you go to the USA about $250. The base used for the valve is nothing special, just £10 can buy a new one, and no special ceramic chimney is needed.

The power supply

The power supply comprises of just four voltages for the amplifier, an EHT (high voltage) supply, a filament supply of 13.4V, a bias supply produced by a high power zener diode and a 12V supply for the relays (TX and coaxial). As can be seen in the accompanying circuit, the first voltage that should be supplied is the AC to the cooling fan, then the filament voltage and finally the high voltage supply. After this sequence (around three minutes via a timer/relay circuit), the relay supply can operate, taking the unit into transmit.

Each circuit should be self explanatory, most important is the EHT supply. The EHT circuit is a voltage doubler. 850V AC exits the secondary of the toroidal transformer, then with the associated two rectifiers (sticks that contain several diodes/resistors and capacitors), and eight electrolytic capacitors with their equalising resistors, produce the voltage doubling circuit. The final DC is around 2200V. This is fed via a feed resistor of 50 ohms at 20W and out of the case using quality coax, it then connects to the RF deck using a TNC plug and socket arrangement.

The filament supply is straightforward, no rectifiers, just straight 13.4V AC. It is advisable to check the heater voltage before connecting the leads up to the valve, some transformers have been known to give up to 15V AC. Make sure that you also load the transformer, to make sure that the volts don't vanish on load. If you use the RS transformer listed, I can assure you that you will not come across any of these problems.

Finally there is the bias circuit, this connects to the cathode (where all the tuned circuit components hang out in the grid compartment!). This circuit again is very straightforward. A lead is taken from the EHT capacitor stack and negative end of the rectifier junction, it then feeds the metering circuit then onto a 10k 12W resistor. This resistor is shorted out by a relay on transmit. The circuit continues onto the cathode safety fuse (1A), and onto the 5.1V 10W zener that is mounted on its own small heatsink. The circuit continues to the grid compartment where it joins the cathode choke.

Details of the parts required are given this month - so you can go 'bargain hunting' at rallies and equipment breakers for some of the component parts. Next month, Geoff continues with further information and the construction of the hardware.

Components List:

Power supply

Meters: 1A and 100mA
D1/D2 Two stick rectifiers available from any Microwave oven dealer, or scrap Microwave oven.
D3/D4 BY127 or 1N4007 type diodes.
C1 to C8 EHT capacitors: These can be obtained from most TV dealers, 600µF 325V will be ideal
C9 1000pF at 5kV disc ceramic.
R1 to 8 16 x 220k 2W resistors to equalise the voltage across the capacitors, or if you can find them 8 110k carbon resistors at 2W
FS1/2 10A fuses and holders
R9 10R 25W
R10 50R 50W
R11 220R 20W
R12 10k 12W
R13 220R 12W

EHT transformer, ILP for toroidals or rallies for surplus transformers

Z1 5.1V 10W stud-mounting Zener diode (Farnell Components)
FS3 1A fuse
The filament transformer is available from RS # 196 353, which is 0 13.4 19.2 26 31.9 V AC.
RS three minute relay/timer (seen at the VHF convention for £8.00)
Single pole 12V relay

RF section

C1 Jackson Bros C804 type capacitor, available from Maplin at around £12 or cheaper at rallies.

C6 Anode tuning capacitor, 0 to 20pF, you may have to fabricate it from a larger value, by double spacing and removing some of the fixed and moving plates. However, there are plenty of variable vacuum capacitors available at rallies these days. I saw several at the VHF Convention earlier this year, their name implies what they are 'Variable Vacuum'. That means that they are a sealed vacuumed unit and must be handled with care. The one I used in this design was 3 to 30pF at 10kV and cost just £5 at Sandown Park.

C7 Loading capacitor, this can be a standard receiving type capacitor and need not be widespaced, anything around 140 to 150 pF should work fine.

C8 DC isolating capacitor, these are very easy to find, use a high working value one such as 20kV, should you get stuck for this part I have dozens of them. This capacitor has threaded connections at each end which ensures a good solid joint.

Input circuit

C2 Input capacitor 3600pF silver mica 1kV
L1 10 turns of 18 SWG 16mm dia
L2 10 turns of 18 SWG 16mm dia
C1 100pF Jackson type capacitor C804

Cathode RFC (choke) 80 turns of 22 SWG enamelled on 6mm tufnol former.

C4 1000pF 1kV decoupling cappacitor from the cathode RFC to earth.
Heater choke (RFC), 15 turns of 16 SWG enamelled on 12.5mm ferrite rod. Note that this is a bifilar winding, in other words two lengths of enamelled covered wire wound side by side on the 12.5mm ferrite rod.
The PTFE bushes that feed the heater/filament volts into the grid box should also have 1000pF 500V decoupling capacitors fitted to earth.

Output Circuit

C8 DC isolating capacitor, 1000pF doorknob at 5kV or 20kV
C6 Anode tuning capacitor, wide spaced and is 0 to 20pF, you could also use a variable vacuum capacitor, these are available at most rallies for about £5, or, the capacitor may have to be fabricated from a 30/50pF capacitor by removing some of the plates
C7 Loading capacitor, this is a 150pF receiver type
L6 (between C6 and C7) 4.5 turns of 14 SWG 38mm dia 50mm long
L7 (between the loading capacitor and the output) 5 turns 12 SWG 12.5mm dia, 25mm long
RFC6 (connects to Valve anode) 40 turns 22 SWG enamelled on a 19mm PTFE rod
RFC7 (connects to RFC6 and to EHT supply) 40 turns 22 SWG enamelled on 6mm tufnol or PTFE rod, not nylon!
The B+ connector (a PET 100 or TNC socket) has a 1000pF 5kV decoupling capacitor to earth at it's entry point into the amplifier

'My Father, Marconi'

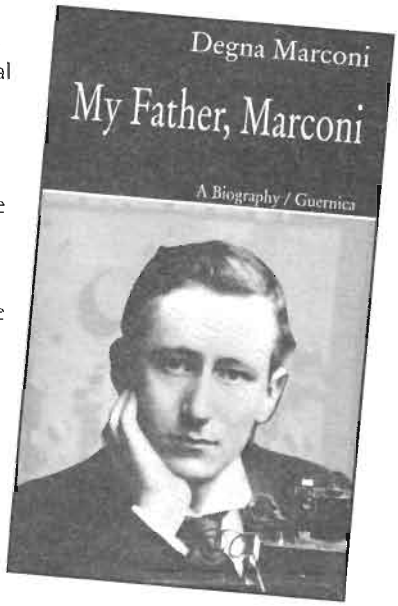
Reviewed by the Editorial staff

There can't be many readers of Ham Radio Today who don't know of Guglielmo Marconi's pioneering work in the field of wireless communication. In 'My Father, Marconi', his first daughter, Degna, recounts his achievements, from his first youthful experiments in the attic of the family home where he spanned a few metres by wireless, then out into the garden, then beyond the nearby hill, and finally across the oceans, providing much-needed safety at sea. This, and the rest as we all know, made worldwide history.

But in this book, the personal background to Guglielmo Marconi's life and work is extensively detailed, where Degna gives an intimate portrait of his turbulent personal life. Including the texts of many personal letters from the man himself, she describes how his single-minded dedication that changed the world played havoc with the lives of those around him. How his marriage ended in divorce. How his children became outcasts in their native Italy, estranged from their father and disinherited by them. The result could have been bitterness. However, as this book reveals, there was forgiveness, warmth and understanding. Degna Marconi's writing reflects her Edwardian childhood and her Italian heritage, and in all gives a detailed and touching personal account of her father.

Readers won't find much in the way of technical information here, but instead a very readable and enjoyable 'insider's view' on the personal life of this very famous man. Our only problem was in the book's binding, where almost all the pages fell out as they were turned when reading the sample copy (yes, it was read all the way through!). But maybe that's an indication of the 'captivating' nature of the book's content.

ISBN 1-55071-044-3, 258 pages 112mm x 190mm, it's priced at £10.50 in the UK and you should be able to obtain it through your local bookshop. Our thanks go to Gazelle Book Services in Lancaster (Tel. 01524 68765) for the supply of the copy for review.



From my notebook

Geoff Arnold G3GSR looks at transmitter power level measurements

One thing that strikes me when looking through advertisements or rig reviews in the amateur press, or eavesdropping on conversations on the air or at rallies, is that everyone still talks about transmitter powers in watts.

It's a good few years now since the 'powers-that-be' decided that henceforth our licensing documents should refer to authorised power levels in dBW - decibels relative to a power of one watt. I can appreciate the arguments for the change in terms of simplicity. However, I have always felt that it was whistling in the wind to expect anyone outside test and development labs, with their expensive level meters and calibrated attenuators, to make the change in day-to-day operations in the real world!

I talked about the dBW and all the other 'referenced' decibel figures in a Notebook back in 1993, but the understanding of transmitter power measurements is something that has troubled some amateurs for years. In their review of the RAE for May 1983, the City and Guilds had put transmitter power measurements on its list of least understood subjects. That was just about the time that the dBW came into force, but I think it might be helpful in explaining the topic to start from the dawn of radio.

Those were the days when a transmitter would be based on spark, arc or high-frequency alternator, and the only way to get an idea of its power was to measure the amps and volts at the supply input terminals, multiplying them together to give a figure in watts.

When valves came into use, the same measurements were used, although now of course there was 'non-productive' filament heating power as well as the anode current drawn by the valve. I say valve - in the singular - because many of the earliest transmitters were just that; a single valve functioning as both master oscillator and power amplifier. If the transmitter was powered by an AC supply, the HT to apply to the anode had to changed to DC, and this would be done by a pair of half-wave rectifiers, which were also valves. This led to the rather odd situation of a single-valve transmitter which visibly contained three valves, brightly glowing through windows in the front panel!

Growing Complexity

Gradually transmitters became more complex, with an oscillator followed by buffers and/or frequency multipliers, followed by a driver stage to produce the RF power required to drive the PA, or FS (final stage) as it is sometimes called. It was realised that including the power consumed by all these earlier stages in the transmitter power rating was becoming ever more of a nonsense, and a new practice was introduced.

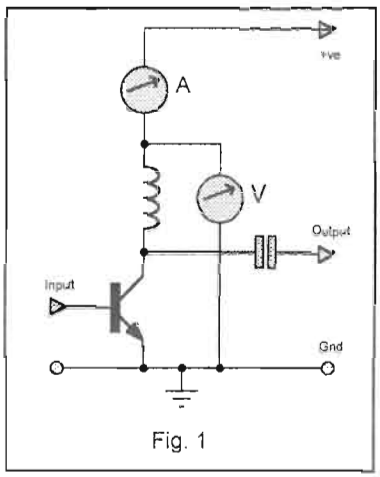


Fig. 1

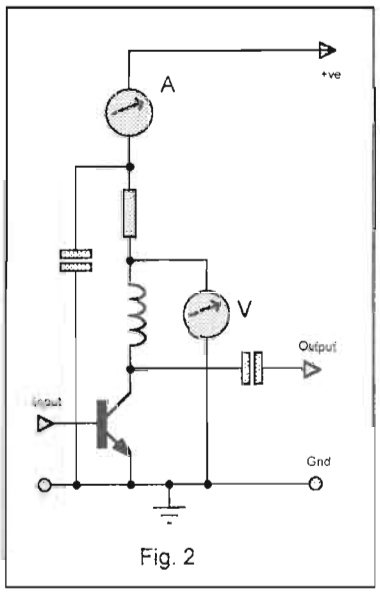


Fig. 2

This was to measure the power input to the final stage. Here I don't mean the RF drive power applied to the grid of the FS valve from the previous amplifier, but the DC power drawn from the HT supply line by the FS valve. The same method was adopted for transistorised transmitters when the solid-state era arrived, the position of the necessary voltage and current meters being shown in simplified form in Fig. 1. Note that the meters must be connected at circuit points where they will not be 'hot' with RF. If there is a decoupling resistor and capacitor in the collector feed, the voltmeter should be connected below the resistor, as shown in Fig. 2, since this is the true DC supply point for the stage.

Measuring in this way at least gives an idea of the power available at the output of the transmitter, as it ignores all the power used in earlier stages, and in a valved transmitter it discounts all the power drawn by the filaments or heaters as well. However, the transmitter output device, regardless of whether it is a valve or a transistor, does not convert all the DC power it draws from the supply into RF power output - in other words it can never be 100 per cent efficient.

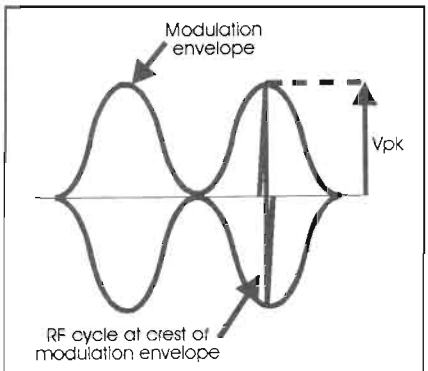


Fig. 3

Exactly what power output you can achieve depends on several factors, including the efficiency of the output stage and the aerial coupling arrangements, the type of modulation, and how much distortion you allow in the output waveform. A rule-of-thumb figure accepted for best possible results obtainable was 66 per cent, so that for the UK amateur licence limit of 150 watts DC input to the final stage, the best you could hope to get out was 100 watts of RF carrier. This was for a mean-power measurement of RF, using a true-RMS indicator such as a thermocouple ammeter measuring current into a known load impedance.

Peak Envelope Power

Once you start to get into the realms of single-sideband transmission, outputs are quoted in a mysterious system known as PEP (peak envelope power). I say mysterious, because it isn't in fact a peak power at all. It is defined in the international regulations as: 'The average power supplied to the aerial by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions'.

Because there is no steady carrier power to be measured, as there is in a DSB telephony transmitter or a CW transmitter, an SSB transmitter has to be specified in a different way, and this 'PEP' idea provides the way to do it. However, PEP can also be used to rate the output of a DSB-plus-carrier stage - a single audio tone is used to modulate the carrier to 100 per cent depth, and the RF voltage at the modulation peak is measured using an oscilloscope (Fig. 3). Knowing the load impedance which the transmitter output stage is driving into, and applying the basic formula: power equals voltage squared, divided by impedance, the power at the modulation peak can be calculated.

In any 100-per cent amplitude-modulated signal, the voltage at the modulation peak is twice that of the steady unmodulated carrier. Since, as I've already reminded you, power is proportional to voltage squared, the power at the modulation peak will be four times the mean, unmodulated carrier power (the square of two is four). This is borne out in practice by the fact that the amateur licence, in the pre-dBW days, allowed a maximum of 100 watts carrier power or 400 watts PEP.

A slight diversion here, to look at transmitters which operate at a constant carrier level - in other words no change of amplitude with modulation is involved. These include telegraphy transmitters, where the carrier is keyed on and off to convey the signal intelligence, and also frequency-modulated transmitters. Applying the definition of PEP given above, it is not too difficult to see that the mean power and PEP will be exactly the same, because such transmitters constantly operate at the same amplitude, other than between signals.

Those dBWs

Peak envelope power in decibels relative to one watt is now used to specify maximum power on all bands in all modes in the UK Amateur Radio Licence. Although it might be thought that mean carrier power would be more relevant in the case of DSB amplitude-modulated transmissions, that isn't really true. Apart from the question of maximum allowable distortion, the ultimate limiting factor on power output in such a transmitter is the peak voltages the output stage will withstand without breakdown. This breakdown might be flashover in capacitors, or in the amplifying device itself, either of which could lead to its destruction. As I've already demonstrated, peak voltage and PEP are directly related.

As with all levels quoted in decibels, 'zero' means no change, either up or down, from the reference level. Therefore a transmitter power output of 1 watt is equivalent to 0dBW, a fact which still confuses some people. Table 1, which is repeated from my 'Notebook' in March 1993 Ham Radio Today, shows a few useful reference points for conversions from watts to dBW and from dBW to watts for typical amateur transmitter powers.

On most bands, UK Amateur Radio Licence-holders are allowed to use a PEP of up to 26dBW, corresponding to 400W, but in the upper section of Top Band (1.850-2.000MHz) the limit is 15dBW or 30W. In the Secondary-user section of 6m (51.00-52.00MHz) the limit is 20dBW or 100W, and in the 4m band (70.00-70.50MHz) it's 22dBW or 160W.

In the 431.0-432.0MHz segment of 70cm, yet another factor comes into play - the gain of the transmitting aerial - for here, the maximum power is specified in ERP (effective radiated power) which is defined as 'the product of the power supplied to the aerial and its gain in the direction of maximum radiation'. The limit in this case is 16dBW, equivalent to 40 watts. This means that if you are using an aerial with a fairly modest gain of 6dB, the power fed to the aerial must be no more than 10dBW or 10 watts if you wish to comply with your licence conditions; and I'm sure that you do!

Note that it is power supplied to the aerial, not the power at the output of the transmitter. So, if you are using 35 metres of UR-67 coaxial cable, with a loss in the region of 6dB at 430MHz, you can legally have a transmitter output of up to almost 16dBW. In this case, your aerial gain would merely be making up for the loss in the transmission line feeding it. That's assuming, of course, that all the coaxial connectors were of good quality, and properly made off to ensure minimal losses in each joint, otherwise you will be losing more than you gain!

Table 1; Useful reference points for conversions from Watts to dBW and from dBW to Watts for typical amateur transmitter powers

Watts to dBW		dBW to Watts	
0.2	-7	-6	0.25
0.5	-3	0	1.0
1.0	0	4	2.5
2	3	6	4.0
5.0	7	12	16
10	10	15	30
20	13	16	40
50	17	20	100
100	20	22	160
200	23	26	400

Letters

Letter of the Month

Dear HRT,

I was amazed a few days ago when a gentleman walked into my retail premises and asked for a 2 metre handy. The reason I was amazed was that I didn't know him to be a licensed amateur, and in a small place like Jersey we usually know everyone. He enquired as to the purchasing of preferably an Alinco hand portable, but specifically asked for 2 metres. I then asked him out of courtesy when had he taken his RAE, to which he replied "I haven't, I want it for Hang Gliding". At this point I was not amused, and explained the licence regulations etc. to him. His answer was "Well if you don't want to sell me one I'll get one elsewhere". He then explained the British Hang Gliding Association do not condone the use of amateur transceivers for their sport! So come on B.H.G.A. tell us more!

Geoff Brown, GJ4ICD

Editorial comment;

A couple of years ago, I went into a local high-street electronics store, which besides racks of components and the like, also sold 2m handhelds, all on a 'self-serve' basis, just like a supermarket. You picked what you wanted, put it in the provided basket which you picked up at the entrance, and paid as you went out. No notices or whatever of "licence required" next to them. Mind you, a few years earlier in Oxford Street, London, Icom 2m handhelds and mobiles were in a hi-fi store shop window display with signs such as "range, 5 miles" marked on them. And some people wonder why taxi drivers are found using amateur rigs.

First club on the net?

To; hrt@netlink.co.uk

Dear HRT.

(Ref. Bristol ARC Internet web site in 'Letters' HRT September 1996);

I am sorry but I don't think Bristol ARC were first on the Net. Possibly we the Felixstowe & District Amateur Radio Society were. Is there any advance on October 1995? We have recently relocated to http://homepages.enterprise.net/agtaylor/fdars/club.html and, like Bristol ARC are in the process of rebuilding pages.

Alan Taylor G7UAJ. FDARS Member.

Editorial comment;

Anyone else out there, roll up, maybe we should start a competition!

Thanks for the prize

Dear HRT,

I am very pleased to hear that I have won the Alinco DJ-190 transceiver in the May 1996 competition in Ham Radio Today. I wish to thank yourself and the company of Waters and Stanton for supplying the prize for the competition also your Technical Editor for his part in my luck (lotto next, he he!).

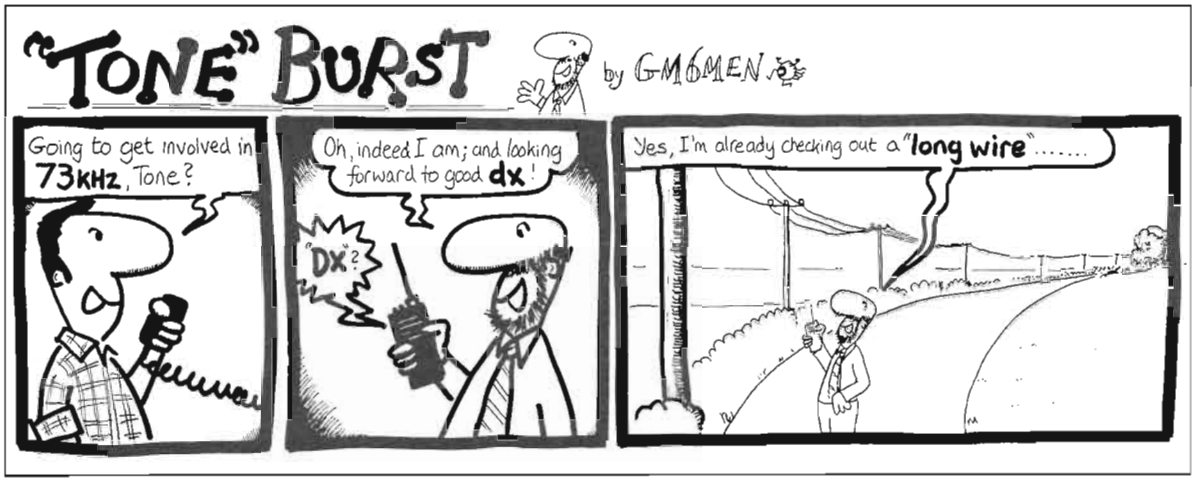
I am a seagoing member of the Irish Naval Service. The Naval Service is celebrating it's fiftieth anniversary this year and is operating a special event station EI5INS. This prize will be well worked in relation to this, as well as being used whenever I am on shore leave around the coast. I'm sure I will be using it to activate some of the more rare squares and islands on the WAI and WAB lists.

I really enjoy your magazine every month, it is in my humble opinion the best currently on the market. Keep up the good work.

G.W. Quinlan

£10 for letter of the month

Do you have something constructive to say on the state of Amateur Radio today? Perhaps you'd like to put your viewpoint to the readers, get some discussion going, or give an answer to one of the issues raised? We'll pay £10 for the best letter we publish each month (normally paid during the month following publication). So write in with your views, to; Letters Column, Ham Radio Today, Nexus, Nexus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST, or fax your letter direct to the Editor's desk on 01703 263429 (fax letters for publication only, for general readers queries please see the 'Readers Queries' section in the 'Who's Who and What's What in Ham Radio Today' section at the rear of this issue), or Email to hrt@netlink.co.uk - please note this is a new Email address for Ham Radio Today Editorial. Please keep your letters short, we reserve the right to shorten them if needed for publication. Letters must be original and not have been sent to any other magazines, and must include name and address plus callsign if held. Reader's views published here may not necessarily be those of the magazine.



Wiring up a Morse key?

Dear HRT,

Not long ago, a customer brought in to me a 2m multimode rig and a Morse key, and asked could I wire it up for him? It was too technical! This was someone who had passed the RAE. Don't laugh at him, blame the Class A and B RAE syllabus, which has no practical content at all. How can we say that Amateur Radio provides self training in electronics, when licensees don't even need to demonstrate the ability to fit a plug on a lead?

We keep reading letters regarding the pros and cons of the need for Morse, this matter just clouds the issue. Isn't it about time the whole examination structure was made more relevant? Does anyone really believe, that upon passing the RAE, one is safe to be let loose with a high power valve linear? Let's get our heads out of the sand and admit that the whole thing needs a shake-up.

The Novice licence is a good idea but it offers too little. The class A and B exam demands too little. The technical knowledge required in the full licence exams bears no relationship, with the power levels allowed, and makes no test of practicable ability. I would suggest a new exam, with technical standards at about the same level as at present, plus some simple practical content in the course. A pass in this exam would qualify for a licence limited to, say, 25W. After operating for 2 years, anyone wanting to upgrade could then take a more advanced exam, if they wished to run higher power. Let's face it, one could have a lot of fun with 25W if it was not for the "must keep up with the Jones's" element forced on us all (I would be more than happy to run 25W if everyone else did the same).

Morse is a communications skill, but it is not the only one (listening on the bands one wonders if that, for supposedly English speaking operators, a test in the ability to speak the English language wouldn't be more relevant!). Why not offer a choice in communication skills for HF operation, and allow either;

1) A second language. Surely in this day and age the ability to have a simple conversation in Spanish, German or French, is more valuable asset than Morse.

2) Simple computer skills. You can't tell me that as a nation we wouldn't benefit more from an increase in computer literacy, than we would from skills in Morse.

3) Morse. In fairness to those who have learnt this mode, allow this as a third alternative for a limited time.

Having been licensed for over 40 years, and a member of the amateur radio trade for half of that, I have seen a real fall-off in interest to the hands-on type of enthusiasm. Let's not try and make the hobby too easy, let's try and make it worthwhile and relevant.

Harry Leeming, G3LLL
Holdings Amateur Electronics

SSL problems again?

Dear HRT,

I read with interest the letter from J. Davis-Bolton G4XPP. I can only echo his comments - the problems with SSL have returned with a vengeance.

I waited over three weeks from the clearance of my payment to the receipt of my renewal documents. Each contact from Bristol, both by phone and letter, gave varied excuses. There is no tie-up between the RA and SSL. The SSL 'Code of Practice Document' is to me a worthless document in every sense.

Thanks for your cheque and for publication of my letter (May 96 issue). I have contributed your £10 and £10 from me to a local charity for the blind. Obviously no one has responded via your excellent magazine.

Regarding callsigns, I recently had a budding RAE pal in my shack. Listening to a station who was 5&9 on 10m FM I said; "When he signs, his callsign will tell us his location", guess what!

Thanks again, Bill G0HUB

More problems?

Dear HRT,

On the 11th July last, my XYL, having been successful in passing the RAE, sent her application off to SSL, complete with pass certificate and fee, for a class B Amateur Radio licence. On the 25th July a telephone call was made to SSL to ascertain what progress had been made on the issuing of said licence (I must point out that, on the application form from SSL, it asks to allow 14 days from the day of posting, and that my XYL had requested to take over my class B callsign). SSL replied that the application had gone to the Radiocommunications Agency for verification that my old class B licence could be used. A telephone call was made to the RA and my XYL was told that it had been sent back to SSL on the 22nd July.

On the 30th July, another telephone call was made to SSL, who informed us that they had received the application back from the RA on the 29th July. This is 7 whole days to get from London to Bristol in a week when there was not a postal stoppage. Today, 2nd August, yet another telephone call was made to SSL, who stated that it had not been dealt with, but that the application was on the desk and that it would be dealt with that afternoon.

The main complaint about SSL, is that I was told that there would be no problem about re-issuing my old call and that on the application form it appears to give the impression that the licence would be issued within 14 days.

C. Stangroom, G0VDL
F. Mcleod-Stangroom, G6CRX in waiting.

QRP corner

Dick Pascoe G0BPS suggests a novel method of powering your QRP rig

I have heard from Pat G3OUC on a couple of occasions in the past about his experiments with his home-brew SSB transceivers. He calls them Skyliners for the bands 160, 80 and 40 metres. But a long letter from Pat took my attention this month.

It was not the interest in his rigs that took my interest previously, but also his involvement in using kites as aerials, hence the name 'skyliner'. His main interest is in flying kites when out portable. This is not too new or even unusual of course, and I have used kites to carry aerials on several occasions, with always at least some measure of success.

Pat uses his rigs on 80m, mainly on SSB but almost always out operating as a portable station with his kite. The following are Pat's own words which I reproduce here with his permission;

"Since the recent interest and manufacture of wind-up radios, I have been working towards using this means of generating power to operate a small HF QRP transceiver. Various ideas were tried such as model aircraft elastic, motor geared to drive a small dynamo, falling weights, also using gears and even a wind-up baby rocker have not been satisfactory.

The main cause of failure being the limited time the power was available and the low output energy. I read in an amateur radio magazine that the hobby would not have a wind-up radio transceiver in the foreseeable future.

I can now report that I have built a form of wind-up power source, which provides enough energy to operate a one watt DSB transceiver.

The heart of the power unit is a foot pedal cranking a ten inch (254mm - Ed) flywheel which drives, by a belt, a bicycle 'Sturmey Archer' hub alternator. The pulley ratio is such that the AC output from the dyno-hub is around 10V instead of the 6V which is normal for a cycle lamp. The AC is fed to a full wave bridge rectifier. The resultant DC is then fed to a bank of capacitors composed of 250,000µF at 50V. The energy stored in the capacitors is monitored by a 50µA edge reading voltmeter. Complete with a discharge button with wire-wound 2 Ohm resistor.

In testing I found that ten seconds of foot pedalling charged the capacitors to 15V with less action required for lower voltages.

To complement this unit I have built a one watt DSB transceiver for 80m, it is VFO controlled 3.6 - 3.75MHz. It uses a NE602 as the mixer, the balanced modulator being a 741 for mic audio. No wasteful components have been used to conserve energy. Bulbs, LEDs and relays are a 'no-no'. I have used three terminal regulators 5V, for the NE602, the VFO and the RIT. This is to enhance stability with the varying voltage supply.

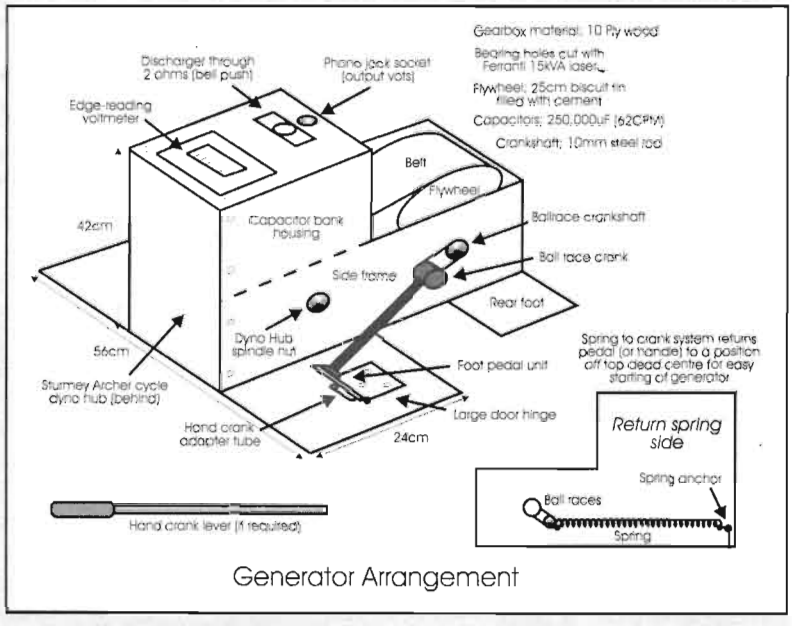
By using this rig and the power source I have had QSOs with G2CXT, G3NVO, G3ZGC, & G3LLK . All gave most favourable reports on signal quality and stability.

Of course time is limited on transmit, however the charged capacitors give two minutes or so, of course during the receive period they can be recharged.

When used with the kite aerial the results should be worthwhile."

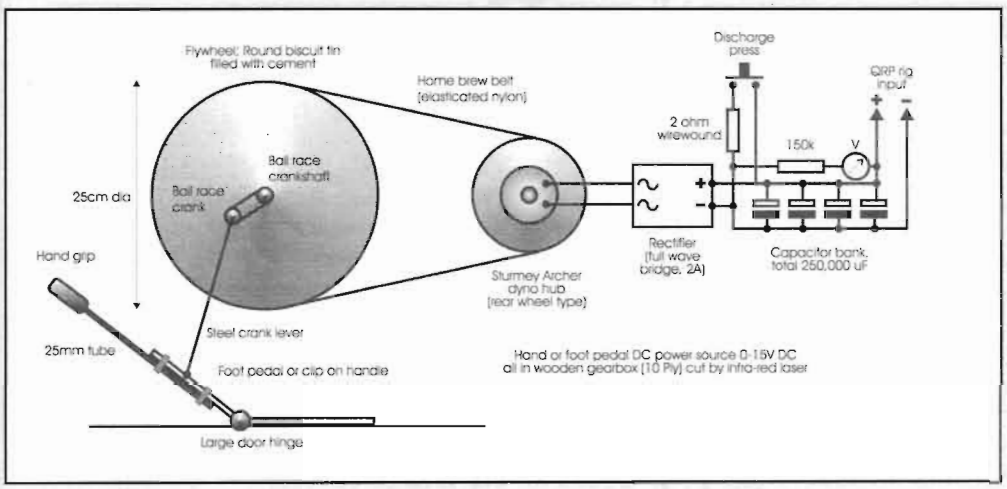
At first glance this type of letter could have been a joke, except I have had correspondence with Pat before about his experiments and it will be seen that the drawings are explicit enough to see that it does work. Isn't it wonderful to see that innovative experimentation is still done by radio amateurs.

I loved the differing construction styles from the old fashioned 'biscuit tin filled with concrete' to the modernistic 'bearing holes cut with 15kVA laser'. I wondered also if the 250,000µF capacitor



Generator arrangement

Hand or foot pedal DC power source 0-15V DC all in wooden box



bank could be enlarged for greater transmit time. Large value capacitors are getting smaller all the time. I was recently looking for some high voltage 330µF capacitors at the Brighton Rally, and I saw some the size of a decent coffee tin. Later I found the same device in a size almost a quarter of the coffee tin, exactly what I was looking for.

As I mention rallies, I went to Brighton specifically looking for some components which I didn't have in stock at home. Just this once I went to a rally as a 'punter', what a wonderful day I had, chatting with old friends and not worrying about how long I was. I have been going to rallies for many, many years and have watched as they declined into computer shows with the odd bit of radio gear also available amongst the used 386's, 286 junk etc.

Looking for the components, such as the capacitors for my power supply project, I found several of the bits I wanted at a price I was willing to pay. Like all constructors, if I can save a few bob I will. Why pay £4.95 for an electrolytic capacitor when I could get it at Brighton for £1.50, leaving me change for the other small bits? Except I couldn't find them! Oh well, back to the catalogues, good job Farnell are still in business.

Change of frequency, again

Once again the QRP fraternity are being besieged by the digital modes, this time by a commercial station from the north American continent, with an ERP of several hundred kilowatts. The 30m band has become unusable on our normal frequency of 10.106MHz, and there have been many suggestions of a move slightly higher to 10.116MHz. This seems to have been adopted by those who use the band without any formal declaration.

This influx of data outside the designated area is happening again and again. On 20m, data can often be heard about 14.060MHz and on our other frequencies too.

Before you shout, I know that we don't own these frequencies. But we have been using them for a long time,, and because of our flea power compared to most, the high power stations will win unless we shout long and hard. Please keep away from the QRP centres of activity!

That's it for another month. News and views to me via the Editor or direct. Packet to GB7RMS, or snail mail to Seaview, Crete Road East, Folkestone CT18 7EG. 72 de Dick G0BPS

VHF/UHF message

Geoff Brown GJ4ICD continues his VHF DX report on the peak of Northern Hemisphere Sporadic E in June/July

The 'PA0' gang in Georgia operating as 4L6PA in June

Well, we continue with the 18th of June producing some spectacular DX on 50MHz.

In Australia, ZL TV was received early in the morning. In Japan, JA6IMJ reported that the 4L6PA expedition was into JA5/6 areas at 0930z. Later in the day the Georgia expedition (4L6PA) worked into PA0 and DL, and Cedric CT3FT worked into W4 and W5, as well as ER5AA and the UK. CT4KQ worked W5's on the same day at 7700km.

Now a little tropo!

Here's an interesting tropo report! Reception of the West Australian VHF Group's beacon on 144.560 MHz at Bunbury, OF76, was reported by Yvon FR1GZ on Reunion Island on 30 May at 13.04 UTC, and 4 June 1996 at 13.31 UTC. This beacon has an effective radiated power of about 100W, horizontally polarised at a bearing of 260 degrees. It is co-located with a 6 metre beacon on 50.306 MHz, with similar ERP and bearing with on-off keying on 50MHz and FSK on 144 MHz. A study of the relevant weather maps and satellite pictures suggests that this propagation over the 6,000km path, was not only possible, but repeatable! de VK6HK.

Back to the 'E'

Continuing on the 19th, things were really dead. But on the 20th, here we go again with opening number 12 from Europe to the USA/Caribbean. That morning, 6m opened to Hawaii from Japan via multi 'ES', with KH6JOI to JJ3WXG, and the 4L expedition group in Georgia worked VS6 (Hong Kong) and S59A. Later that day CY0AA (Sable Island) worked into EH8 and EH1, the latter being his first European contact.

Reported in the UK, Holland and Belgium was KP4EIT who was S9 both ways in Jersey. Also on the band was KP4A, and yet again the VO1ZA beacon was heard, but no CY0AA in to the UK! It really is amazing that so many double hop Sporadic

WA1OUB's transatlantic report of 48MHz video reception

Here are the number of minutes of Transatlantic propagation above 48.24 MHz, biased heavily in favour of 48.250 Spanish TV, for the weeks of the Summer Es season so far.

Week of	Minutes	Date this week	Minutes
21 Apr	0	23 Jun	248
28 Apr	10	24 Jun	18
05 May	361	25 Jun	90
12 May	388	26 Jun	28
19 May*	1199	27 Jun	318
26 May*	2147	28 Jun	190
02 Jun*	2070	29 Jun	321
09 Jun*	3867		
16 Jun	1876		
23 Jun	1213		

* = Week or day with either transatlantic beacons or QSOs on 6m

Summary

Conditions continued to decline for the second consecutive week although the rate of decline has slowed slightly. This is also the second consecutive week of no in-band transatlantic propagation. In addition, this is the second straight week where a severe reduction of 'mystery mod' propagation (peaks about 1430 UTC) was noted. A slight upward trend may have finally started - effective 27 June.

Trends

A little background based on only the measurements for this one season:

1- Out of the 12 days of in-band transatlantic propagation, 10 of the 'productive days' were part of a slow rising upward trend.

2- The two remaining days that do not fit this pattern had propagation to EH8BPX.

3- When conditions are good to EH8BPX, video is not detectable over 50% of the time.

4- The absolute minimum value of minutes for a total day, that produced at least one contact to mainland Europe or the UK is 278.

5- The average value of minutes for a total day, that produced at least one contact to mainland Europe or the UK is 585.

Only stations with 'EH' in their callsign are allowed to operate from Spain on 50MHz (permit holders). CEPT 50MHz operation is not allowed

'E' events have so far materialised in June. The single hop events seem very poor, but which would you rather have? Quality or quantity?

At 0704z on the 21st, the band opened again, straight into double hop. 2E0AJE reported 4X1IF, this was the first and only station on the band, no intermediate stations were logged.

At 0932z, G4JCC in Hants made the first G to 4L contact, followed by David G3FPQ, G3KNU and XYL Betty G0NYL. It took some 90 minutes later before your's truly worked the Georgia station for country number 154.

On the 22nd, 4L6PA worked many PA0's, SM's and G4IFX in the morning. Sunday the 23rd was some day! The band opened early with 4L6PA working many G's and much of Europe, also reported were more openings to JA and VS6. Things then went downhill again. The whole of Europe was hoping for propagation to Sable Island (CY0), as Mike VE9AA had been operational from there from the 18th, but so far the only station in Europe to have worked him was EH1YV in Spain. It was understood that Mike had a few problems on Sable which were not apparent to us. However, one disappointing factor was that a beacon or keyer was not running all the time, so we couldn't tell whether we had propagation or not. This idea of running a keyer/beacon is so important, take for instance one of the quiet days during the Cape Verde expedition last year. The keyer was running all the time with breaks of 5 seconds. Two hours had passed with no QSO's, but suddenly the keyer was answered by G3KOX. There were no signs of beacons or video on the band, so how many openings were missed to CY0? You may well ask!

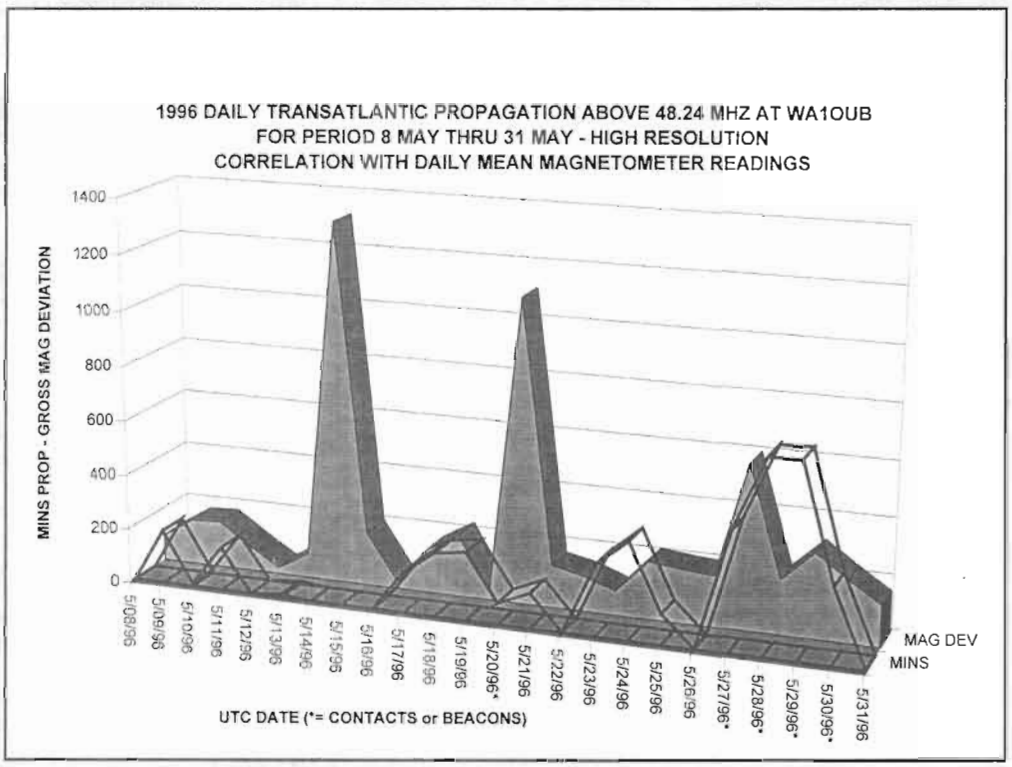
The 27th brought 4L6PA into Denmark, this was their final day of operation before leaving Georgia to return to Holland. Well done lads, you did an excellent job with over 500 QSO's in the log including JA and VS6. Again things went downhill, but see the accompanying table on the previous page for Bob's transatlantic report of Spanish video (48.250MHz) reception so far for this year, along with the charts.

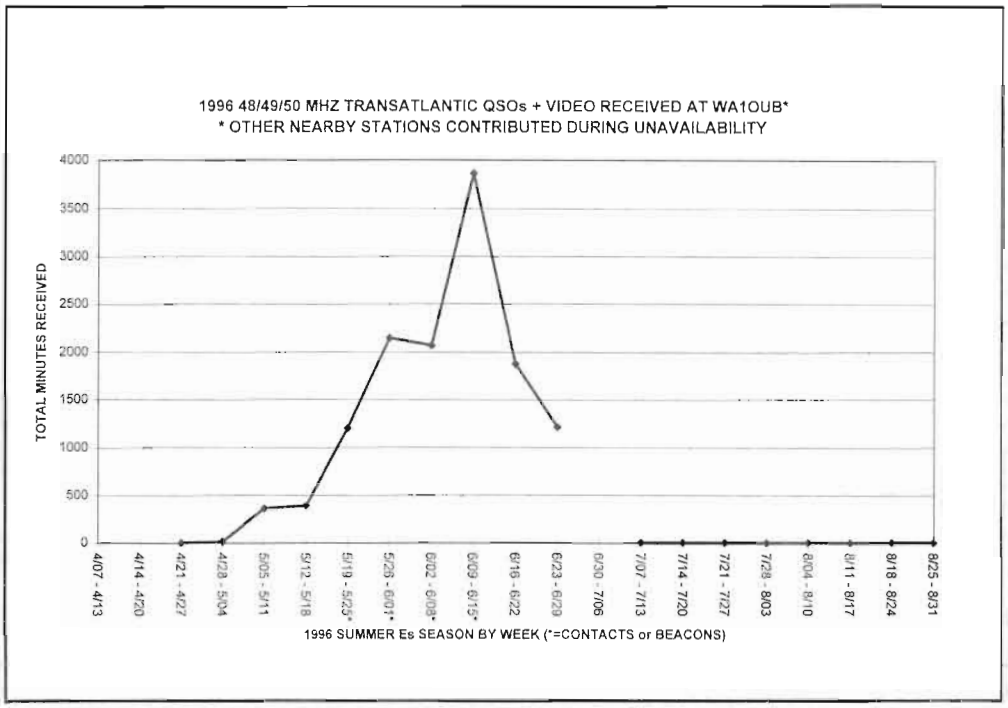
Meanwhile back to the question of where has all the short range 'ES' gone? Well, Sunday June 30th brought a little short range E's, EH7AJ/P operated from IM78 which was a new square for everyone. The band was also open from G to Italy and Croatia. Several readers contacted me saying things had been very bad this season via Sporadic 'E'. 2m openings I do agree have been down on previous years, but, down in the south of the country things have been quite good.

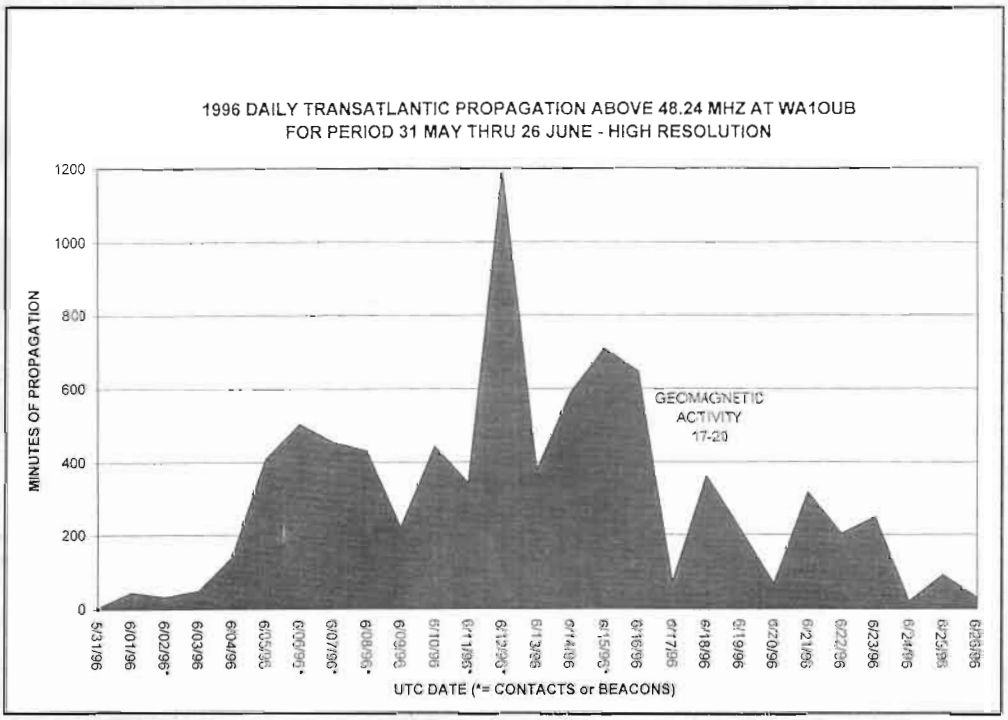
By the end of June, Chris G3WOS had worked 56 countries on 50MHz. David G3FPQ (a newcomer to 50MHz, but not to HF operators) had worked 54, and your's truly had worked 63. So geographical location does play an important part. No doubt stations in southern Spain have worked many more!

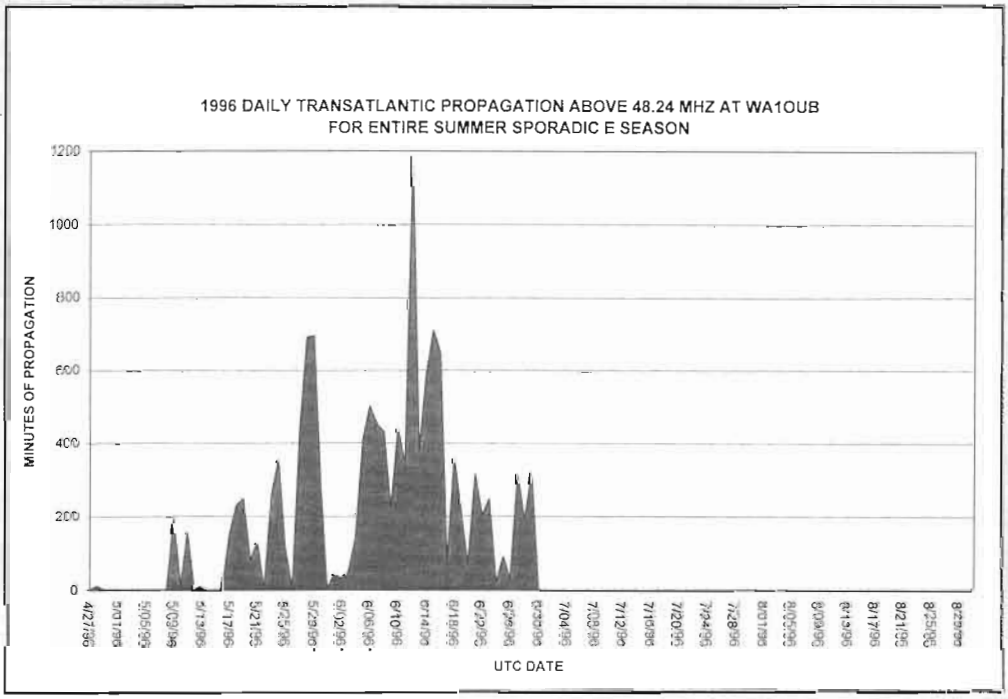
So, it's into July we go and the first report was from G4VPD, who worked EU1AA on Six and spotted it as DX. It does show you how desperate conditions have been in certain parts of the country. Later in the day, I had the distinct feeling that things may perk up, and they certainly did. At 1734z I made the first QSO with CY0AA on Sable Island. The band in Europe was humming, but I decided to keep the beam west, that was most rewarding for country No.156. Also reported was Jimmy W6JKV operating as V47KV located on St Kitts in the Caribbean, he worked the length of the UK. In fact, I have a recording of Betty G0NYL working V47KV, she is stronger than him via backscatter! KP4EIT showed up again, several phone calls were made to the UK and many G's managed to work some new DX. CY0AA was also worked on SSB from Jersey. CO2?? was heard but lost due to QRM from an EA on 50.110MHz working into PA0.

CY0AA's opening to Europe finished around 1830z with Ken G4IGO making the grade. Jose EH7KW reports having good conditions to W4/5. His best









DX was KB5IUA at around 8057km, which was a new 1996 ES distance record.

On the 2nd July the band opened again to Canada. VE1PZ along with others were worked, and the VO1ZA beacon was heard. Neil G0JHC was very upset that VE1PZ was S9+ and CY0AA had flown the nest. That's what you call Murphy's Law - well that's what he was told!

The next day, CY0AA was spotted on the DX cluster. What was going on? Yes they were still on Sable, trapped by fog. Of course there were no conditions/propagation on 50MHz, that was just typical. The days passed and still CY0AA was stuck on Sable, but still there was no propagation to Europe. Finally on the 6th the expedition crew managed to fly out, after making a total of 15,000 QSO's, 900 of them being on 6m.

Enno PA0ERA, operating as 5B4/PA0ERA from KM64 on Cyprus, was worked extensively in the UK on the 6th. July 7th saw cluster reports of UR4LL in KO70, along with EW1OD, EV1OD in KO42. Later in the day the VO1ZA beacon was heard in GJ and ON, to bring the 16th transatlantic opening so far this year.

Finally, I have included a series of charts from Bob WA1OUB's observations so far this year. Look carefully and see if you can spot any collation between solar influence and the Sporadic 'E' openings.

That's all I have room for this month, see next month's issue for part three. News and views please to: Geoff Brown, TV Shop, Belmont Rd, St Helier, Jersey, Channel Islands, or via Email to equinox@itl.net, or even packet at GJ4ICD@WD5B or GJ4ICD@GB7GSY, or GJ4HXJ@GB7GUR - I even have a phone; Tel. 01534 877067

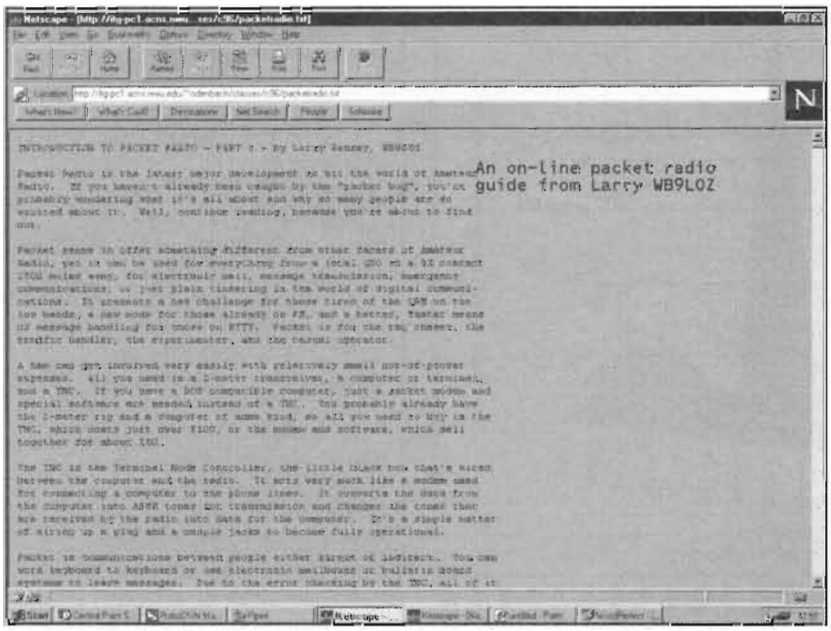
DATA Connection

Our resident data SysOp finds a comprehensive on-line guide to packet

This month's issue comes with a cover-mounted PCB to build a simple JVFAX/HamComm receive interface, which I'm sure will be of interest to many Data Connection readers. This can be used with a number of readily-available public domain and shareware programs, for off-air decoding of several data modes.

How about ideas for another possible PCB in the future? One that's been suggested to me is a TCM3105 based packet radio modem, to again use with a suitable program on your PC. As well as the very popular BayCom, a shareware DOS based program MUBAY from Jon G7JJF is readily available, Jon is also putting together a Windows-based version, both using this type of interface.

One problem is the availability of suitable TCM3105 ICs for the modem, they're a little hard to find now. Another is any possible copyright issues, as I wouldn't wish, in any way, to 'step on the toes' of the superb work done by the BayCom team, who've spent a lot of time and effort in designing the original modem and software. I'm open to ideas.



On-line packet guide

I'm often asked about which packet guide I'd recommend. Well. here's a free one, and it's very comprehensive. It's written by Larry Kenney WB9LOZ, and I'm told it's been placed into the public domain by Larry, for all to use. It's on-line in the 'net, at http://itg-pc1.acns.nwu.edu/~odenbach/classes/c96/packetradio.txt (watch your typing!). By this time you'll hopefully also see a one-touch link to it from the 'links' page of the Ham Radio Today web site (http://www.netlink.co.uk/users/hrt). I also have it here, stored as an ASCII text file on disk, and if there's demand (drop me a packet message if you're interested) I can arrange to have it included on a disk from the HRT software offer for the benefit of readers. Thanks for a superb text Larry, I hope many beginners to packet gain use from your immense amount of work.

TAPR

If you've got past the 'beginner's' stage and are interested in technical developments in packet radio, then the TAPR (Tucson Amateur Packet Radio) group's Internet site at http://www.tapr.org is well worth a visit. I've spent plenty (often too much!) time there, for example in listening to on-line 'Real Audio' speeches from recent digital radio conventions, complete with on-line slides. The TAPR group also run special offers, such as 'bulk buys' of DSP boards, GPS equipment, and the like. Again, you'll find a link to it from the Ham Radio Today site.

The TAPR web site has plenty to interest packet users

Under 25's packet group

We already have the BOFARS packet club for the boring old 'uns among us, now there's BYFARS for the under 25's (which rules me out)! In a packet bulletin, organiser Duncan G7MZK asks "Do you feel the need for a bit of fun over the air? Are things getting a little dull or uninspiring? Is everything getting a little

serious and heavy?". He says that now is the time to start to add a little fun and interest to the screen and keyboard on your computer. The aim of the society is to create a 'lighter' side of amateur radio for the younger person. Membership is free, and the society promises good fun for all members in discussing topics, ideas and exchanging jovial banter. To enrol, just send Duncan G7MZK@GB7SYP.#19.GBR.EU a packet message with the following details: Name, Location, Home BBS, Age (if you want to give it), Birthday (if you want birthday greetings sent to you), plus any other information or ideas. It should certainly make a change from reading the continual 'debate' topics on packet!

BBS SysOps

The System Operators of our packet BBSs are a hard working bunch. Keeping a BBS running, particularly in 'tidying up' files and message listings, takes quite a while each day, usually at least an hour or two (I know from personal experience, and very boring it often is!) One SysOp has been reported to spend over 25 hours a week maintaining his BBS for the benefit of users. Besides the time, which your local SysOp often does because he or she enjoys doing so, a BBS does also have running costs. Just work out how much keeping a PC and, say, two rigs, TNCs and the associated power supply going, 24 hours a day, costs. If you actually do work it out, rather than just guess at a figure, you'll probably be surprised. Then, divide that cost (usually well over £100) by the number of supportive users. That's right, supportive. 'Hinting' at contributions to running costs on his BBS reportedly gained one SysOp a formal warning from the 'powers that be'.

In chatting last month with a BBS SysOp, whose system serves a major UK city, I asked him how many of his users had made a donation, however small, to his BBS running costs. The answer was four. If you use your local BBS, and you'd like to see it stay on the air, then think about this, and at least offer to help a little, even if it's just 'your' proportion of the electricity cost.

Maxpak news

Maxpak, the Midlands AX25 packet group, tell me that the refurbishment of GB7AP has commenced, and that the main AP21 and AP72 nodes are now operating from a new collinear aerial at a lower height, which it's hoped will give easier access for local users - the original aerial simply 'heard' too much! A direct, inter-node link to the WV site will be operational soon, and a 70cm beam is planned to be installed at 82m agl on the site's main mast, beamed towards GB7WRG to provide a 9600 baud trunking route for northbound mail.

The installation of a 9600 baud 144.525MHz node is also now in hand at WV, which will give a fast direct high speed access to the GB7MAX BBS.

The group's August/September issue of their bi-monthly journal, Digicom, besides containing all the latest Maxpak group information and news, has a nine page Beginner's Guide to BayCom version 1.6, including a useful list of basic commands and 'hot keys' for the program. I'm told the group also distribute the program under licence, they also supply their MAX-01 modem kit for use with the program.

You can get further information on Maxpak from Richard G1NZZ @ GB7MAX.

BARTG

Another journal which I received this month was Datacom from the BARTG (British Amateur Radio Teledata Group). Within its 72 pages is plenty of information on the group's activities, including contest news, plus articles on subjects like "AFSK with the IC-775 and IC-706" and the "R5 Audio Filter Revisited". A message from the Group's Secretary, Ian G4EAN tells me that the contact details for the BARTG have now changed slightly - you'll find the current information in the 'Club News' section of Ham Radio Today each month.

UK/US packet link

From Mike, KD4EMI @ KD4GR.#SUNFL.FL.USA.NOAM comes information that he's looking for anyone in the UK to 'hop the pond' to his packet station in Florida, which operates on 10.151MHz LSB, 24 hours a day. If you'd like further information, Mike's Internet address is kd4emi@aol.com

GTOR activity?

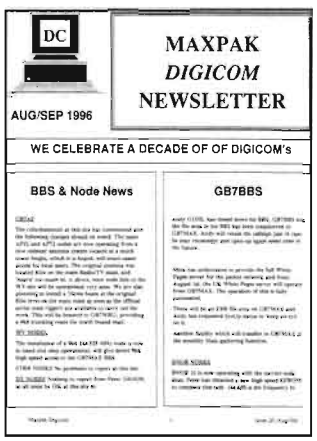
A number of amateurs have asked if there is any GTOR activity? GTOR is the mode developed by Kantronics, and is included in their TNCs such as the KAM. I must confess that I have GTOR availability here, but I also rarely hear it used on the air, despite it's claimed benefits over a number of other digital modes. Has it died?

I know of amateurs in the US who are active on the mode, like Trish WA6UBE in San Jose in the western US, who's an avid user of GTOR. She monitors 3.634MHz mark in the evenings, and the City of San Jose Office of Emergency Services' centre also has a commercial HF station set up in GTOR standby mode on the same frequency. On a more international level, a GTOR 'calling' frequency of around 14.068MHz tends to be used, and GTOR co-exists with PacTOR in the same segments of various HF bands. But is there a GTOR HF BBS somewhere in Europe? Is there activity we don't know about? Drop me a message if you're active on the mode, maybe I can help to get a 'net' together?

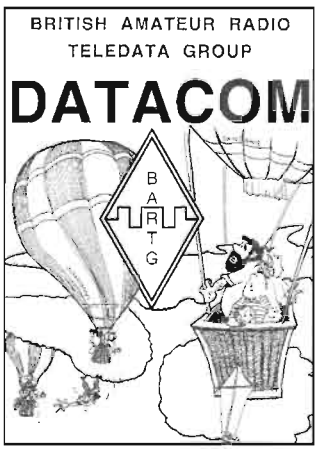
CTRL-Z, end of message

If you're reading this just as this issue of the magazine appears, then this weekend, on Sunday October 6th, I'll be along at the International HF Convention giving a talk on Digital Signal Processing in modern amateur equipment. If you feel like coming along to say 'hello', I'll be very pleased to see you, you might even be able to get an insight as to the exciting possibilities of DSP in the future. Alternatively, later in the month I plan to be helping the Editor answer questions on the Ham Radio Today (stand 12, in the Sales Hall) at this year's Leicester Exhibition. Again, I'll be very pleased to meet readers 'face to face' as well as via the keyboard.

That's it for this month. As always, please do let me know what you're up to in the ham radio data communication side of things, or indeed what your local group are doing. You can contact me either direct via packet, or via post, fax or Email c/o the Ham Radio Today Editor. Until next month, 73 from Chris G4HCL @ GB7XJZ.#48.GBR.EU



Digicom from the Midlands AX25 Packet Group



Datacom from the BARTG

Satellite rendezvous

Richard Limebear G3RWL reports on the possibility of an Oscar-13 contest as it approaches re-entry

The Mir Space Station as seen from the Shuttle. *Photo courtesy NASA*

By October, but perhaps earlier, it will become necessary to move AO-13 to ALON/ALAT 90/0 to provide limited protection of the omni antenna from perigee heating and to reduce the drag associated deflection of the ALAT. From this point until the demise of the electronics, AO-13 will be Mode-B only, full-time omni antenna, the same as with AO-10.

The next few months will be an interesting time, and the command team welcomes suggestions to make use of this unique opportunity to observe an amateur spacecraft as it approaches re-entry.

Peter DB2OS proposes an alternative to a recent suggestion that a contest be staged to bid farewell to AMSAT-OSCAR 13. Peter suggests a different kind of contest, like encouraging people to listen to the PSK Telemetry beacon. Those who definitely recorded the last telemetry frames before the beacon goes quiet could be listed in the publications put out by the various AMSAT organizations or maybe even receive "a (very) small prize". He believes that this may help to get people interested in listening and decoding the PSK telemetry for P3D, and might allow us to get a good coverage of the last telemetry before AO-13 ceases operation, especially if this happens over regions where the command stations do not have good visibility.

MIR SAFEX system

Shannon Lucid has confirmed that Mir's packet station is inoperative. The SAFEX II equipment on board MIR's PRIRODA module has been powered on since July 12. Currently it operates in the QSO mode, callsign RR0DL, connected to the digital speech recorder. You can listen to a short message recorded from the cosmonauts on 437.925 MHz.

Note: At present it is only possible to listen to the repeater's automated message. The other modes are expected to be tested in the coming weeks. Reports are sought concerning SAFEX signals; it is asked that such reports be sent to DL3LUM.

For working via the repeater you must use CTCSS tones, these will be published after checkout. The Doppler shift is +/-10kHz, that means between the start and the end of all passes you have a total difference of 20kHz.

The SAFEX system is comprised of two main parts with auxiliary equipment:

1. Radio equipment in the 430 MHz amateur band (duplex shift 2.2 MHz).

2. Radio equipment in the L/S band (uplink 1265 MHz, downlink 2410 MHz).

The first covers primarily the desire for amateur communication and the second is designed as an experimental system, transponder operation, amateur television, and future experiments.

Experience of earlier missions shows that astronauts and cosmonauts are very busy; therefore the new equipment must offer technical arrangements which permit amateur radio activities without active crew operation.

There is already a 2m amateur radio station on the MIR space station but it is installed into another module of the station. It is planned to install a 144 MHz radio, which will be switched by a diplexer, in order to make operation possible on 2m or crossband.

There are four modes of operation:

Mode-1, Relay Operation
Downlink: 437.950 MHz
Uplink: 435.750 MHz,
CTCSS tone for operation.

Mode-2, Data (Packet Radio)
Downlink: 437.975 MHz
Uplink: 435.775 MHz,
no CTCSS.

The new device operates as a digipeater at 9600 baud. There is also a laptop PC available at the station for mailbox operation.

Mode-3, QSO Operation of the MIR Crew
Downlink: 437.925 MHz
Uplink: 435.725 MHz,
CTCSS tone for operation.

The cosmonauts can perform regular QSOs and can also carry out special functions with this device. In addition, the cosmonauts have three other possibilities:

1. In special cases a CTCSS tone can be switched to the transmission and DTMF tones can be used. The crew does this in case they want to contact specific prepared stations. This is planned for emergency use, contacts with control centres, and their families. Ground stations can be equipped accordingly, so that the cosmonaut can dial into a telephone system with DTMF tones in order to reach his XYL or someone else. If this is noticed, please do not interrupt.

2. Also a digital voice recorder will be built into RR0DL. With it, the cosmonauts have the possibility to transmit a message worldwide. They record a text on the digital voice recorder and this text will be transmitted at regular intervals (with a duration of up to 2 minutes, then a 2 minute break).

3. Picture transmission, this part is new; a system was developed for transmitting pictures in digital form. The crew on board MIR can take pictures with a still video camera and these can be stored in the laptop PC. The basis for picture transmission is the AX.25 packet protocol. The picture pixels are transmitted in pseudo-random format. With this system, recognition of pictures after only 30 % transmission is possible, missing pixels will be mathematically added at the end of transmission. Transmission time for one picture is 3 minutes. Amateurs can receive the picture with a normal packet TNC with 9k6 modem and special software from JVFAX (not available yet).

Additionally, remote control is possible from R3K and DF0VR.

Micro/Digital Satellites

WEBERSAT-OSCAR-18: (WO-18) has experienced many software crashes recently. Efforts are under way by the command team to identify the cause, and make the appropriate corrections. The controllers all hope that WO-18 will be operational again very soon sending telemetry, photos, weekly whole orbit data (WOD), and light spectra of the Sun or Earth.

In July, new software was installed into DOVE. It sent a few channels of ASCII telemetry every few seconds before the 2m transmission disappeared again; apparently the S-band transmission is still on. DOVE was last on the air with its full complement of software briefly during last Christmas. Attempts to update that software in January '96 were unsuccessful. Numerous attempts since then to load the normal operational software have also failed. Various programs have been loaded that performed tests on hardware components we suspected could be the problem, but all tests were negative.

Their attention turned a few months ago to creating totally new software that would at least get the 2m transmitter on the air, provide some data usable for educational purposes and perhaps allow more complete hardware testing. The DOVE team also wanted to assure they could keep the S-band beacon on. The software recently tried is a step toward those goals.

Recently a problem turned up on KO-23 causing unfillable holes when trying to update the directory. This was under investigation when KO-23 crashed (it's not sure if the crash was a result of the investigation or some other, possibly related, cause). KO-23 is flying in a higher radiation environment than the other MicroSats and, when launched, the lifetime was expected to be only a few years because of this. Maybe we are seeing the start of radiation-induced degradation; folks should keep an eye on the EDAC count in one of the spacecraft's status lines. Please report back if you see anything of interest.

KO-25 now appears to have both uplinks switched on (145.870 and 145.980 MHz).

JAS-2 launch

The JAS-2 launch should now have taken place, this was planned for 17th August with the ADEOS earth observation satellite that is the main payload on the 4th launch of the Japanese H-2 rocket.

As with FO-20, once the main payload was released the launcher will have re-ignited its motors and fire until depletion; so an elliptical orbit was expected with inclination of 98.6 degrees and a period greater than 102 minutes. At the moment of separation, JAS-2 should have been activated and CW telemetry transmitted on 435.795 MHz (the frequencies are the same as FO-20).

A World Wide Web Home Page has been established by JARL to provide information on JAS-2. The URL is:
?http//www.jarl.or.jp/jarl/jas-2/

Listeners will recall that UNAMSAT-1 was destroyed when the 5-stage Russian 'START' launcher blew up about the time of 4th stage ignition. The START launcher is a converted SS-25 ICBM.

UNAMSAT-2 is a clone of UNAMSAT-1 which was a copy of the AMSAT Microsats (like AO-16, LUSAT, DOVE, WeberSat, EyeSat and ITAMSAT) with 5 module trays mounted in a 25 cm cube. The principal research experiment for UNAMSAT is still a 41 MHz long-pulse meteor radar transmitter and DSP receiver mounted in the TSFR ("This Space For Rent!") module. The other 4 modules include 70cm PSK downlink transmitters, 2m uplink receivers, V40 computer and the power module. The initial orbit information is 1000km altitude and 83 degree inclination in a very circular orbit.

Downlinks:
UHF TX1; 437.206 MHz
UHF TX2; 437.138 MHz (secondary).

Uplinks:
VHF CHA; 145.815 MHz
VHF CHB; 145.835 MHz
VHF CHC; 145.855 MHz
VHF CHD; 145.875 MHz

The modulation is the same as in the previous Microsats.

On 4 June 1996 the maiden flight of the Ariane 5 launcher ended in a failure. Only about 40 seconds after initiation of the flight sequence, at an altitude of about 3700m, the launcher veered off course, broke up and exploded. A detailed account is given in the official report, which concludes:

"The failure of Ariane 501 was caused by the complete loss of guidance and attitude information 37 seconds after start of the main engine ignition sequence (30 seconds after lift-off). This loss of information was due to specification and design errors in the software of the inertial reference system. The extensive reviews and tests carried out during the Ariane-5 development programme did not include adequate analysis and testing of the inertial reference system or of the complete flight control system, which could have detected the potential failure."

DJ4ZC (the Phase 3D Project Leader) and several AMSAT-NA people were due to meet with ESA and ArianeSpace people after the report came out so we hope that, following these meetings, more light can be shed on the implications for the launch of Phase 3-D.

DJ4ZC honoured

The prestigious German Horkheimer Prize has been awarded this year to AMSAT-DL President Dr. Karl Meinzer, DJ4ZC, at the Ham Radio convention at Friedrichshafen, Germany. The prize is awarded to members of an IARU amateur radio society by the Deutscher Amateur Radio Club (DARC) for "merits of amateur radio, its further development and the targets of DARC". It is named after Rudolf Horkheimer, one of the first radio amateurs in Germany. Dr. Karl Meinzer, DJ4ZC, has been honoured for his outstanding achievement in the technical fields of the amateur radio service for decades.

Shuttle ham KB5AWP

Shuttle astronaut Ken Cameron (Colonel, USMC) left NASA on August 5 to pursue other career interests. He first flew as a pilot on STS-37 in 1991 and served as commander on two subsequent missions, STS-56 in 1993 and STS-74 in 1995.

Ken, KB5AWP, has always been one of the biggest supporters of SAREX. Most of the astronauts who have ham licenses have decided to get their licenses because of Ken's encouragement. All three of his shuttle missions have featured 'all-ham' crews.

AMSAT-UK news

The 11th AMSAT-UK Colloquium took place at Surrey University, Guildford at the end of July. Several people who couldn't get there have asked how to obtain a copy of the 'Proceedings' document. The price is £10.00 plus postage, obtainable from the Amsat-UK office.

For further information about Amsat-UK contact: AMSAT-UK, c/o Ron Broadbent MBE, G3AAJ, 94 Herongate Rd, London, E12 5EQ. A large SAE gets you membership info, and SWL's are welcome. All new joiners get the USAT-P tracking program on 5-1/4 disk.

Latest Keplers

A copy of the latest Keplers is available on request by mail or packet; my mailbox is GB7HSN but please note that Amsat-UK Keplers are put out on packet weekly sent to KEPLER @ GBR. When asking me for Keplers please say which satellites; All means about 200 satellites. ("all amateur sats" is adequate if that's what you want).

The latest satellite Keplers as supplied by AMSAT-UK are also available by automatic fax retrieval from the 24hr Ham Radio Today fax-back line, 01703 263429 (use with a personal DTMF, i.e. 'touch-tone', phone/fax keypad - follow the voice menu), request fax document 8 from the satellite voice menu for this month's.